THE LOSS AND SALVAGE OF *F-4* pg.22

Winter2006

UNDERSEA WARFARE

U.S. SUBMARINES... BECAUSE STEALTH MATTERS

SSGN
TRANSFORMATION

USS *Ohio* Returns to Service, Brings New Fleet Capabilities

INSIDE

USNA's Commandant of Midshipmen Molds Future Warriors

Sea Predator – Tomorrow's Autonomous Undersea Weapon

Submariners Return Home for the Holidays

Winter 2006
Vol. 8 | No. 2

UNDERSEA WARFARE
THE OFFICIAL MAGAZINE OF THE U.S. SUBMARINE FORCE

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by Capt. David T. Norris, USN

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On The Cover

USS *Ohio* (SSGN-726) departs Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Bremerton, Wash., to conduct sea trials. The reshaped hull, as seen in this photo, easily distinguishes SSGNs from SSBNs.

Photo by Rick Chaffee

As the CNO pointed out in his Guidance for 2006, "Our strength and our future rely on our diversity". A more diverse Navy means a stronger Navy and – in turn – a Submarine Force with the best and brightest minds.

RDML Joseph A. Walsh, USN, Director, Submarine Warfare

The Submarine Force stands poised and ready to take on the challenges and opportunities of 2006. Our services are in high demand, we are building new ships and we are modernizing the ones we have. Our contributions to the Global War on Terror (GWOT) are significant, and our ability to meet potential future threats is unsurpassed.

Speaking of preparing to meet future threats, in his May 2001 commencement address to the U.S. Naval Academy, President George W. Bush made a reference to the SSGN conversion plan, citing it as a transformational program needed for today's security environment. With the return of USS *Ohio* (SSGN-726) to the fleet, 2006 will go into the books as a year of transformation. *Ohio* embodies a unique transformational spirit and is a shining example of forward thinking and adaptability. You can read more about *Ohio* and the capabilities she brings to the fleet on page 18 of this issue.

When looking at capabilities and what the Submarine Force brings to the fleet, a relevant topic is our force level – where are we and where are we going? The first ten *Virginia*-class submarines are under contract and the next contract will be negotiated in 2008. With the current *Virginia*-class build rate, the SSN force level will remain relatively stable between now and 2013. The current program of record reflects an increase in the *Virginia* build rate from one per year to two per year starting in fiscal year 2012. Regarding SSBNs and SSGNs, the force level will remain constant at 14 and 4 respectively, for the foreseeable future.

Although we are enthusiastic about our submarine platforms, we are just as inspired by the many new technologies that were developed and came to fruition over the past year. For example, in July, we launched the first Unmanned Aerial Vehicle (UAV) from a submarine – USS *Albany* (SSN-753). The use of this technology for force protection and reconnaissance has great potential. In November, we successfully conducted a land launch demonstration of the Littoral Warfare Weapon (LWW) – a future subsurface-to-air or surface missile. You can read more about another new technology – an underwater glider – on page 10 of this issue. Innovations like these are just a few examples of the many ways we are working to increase our dominance of the sea.

On page 22 of this issue, you will find an in-depth historical analysis of the loss and salvage of USS *F-4* (SS-23). *F-4* was the first U.S. submarine to sink with a loss of life. In light of the events surrounding the stranding of the Russian mini-submarine *Priz* this past summer, submarine escape and rescue is more relevant than ever before.

Moving on to people news, diversity is one of many issues facing the Navy today, and it is not just about numbers. As the CNO pointed out in his Guidance for 2006, "Our strength and our future rely on our diversity". A more diverse Navy means a stronger Navy and – in turn – a Submarine Force with the best and brightest minds. The more diverse we are, the greater the pool of knowledge and experience we draw from. One of those "best and brightest" minds, CAPT Bruce Grooms, is featured on page 6 of this issue. Bruce, who serves as Commandant of Midshipmen at the Naval Academy, is leading and shaping our future leaders.

I would like to take this opportunity to thank the Naval Submarine League, not only for their tireless advocacy on behalf of submariners everywhere, but for their continued support of UNDERSEA WARFARE Magazine's Annual Photo Contest – an event they sponsor every year. As in previous years, the winning photographs will be announced and featured at the annual Naval Submarine League Symposium, and the summer edition of this magazine. You can find more information about this year's photo contest on the inside back cover of this issue.

In closing, there is much on the radar for 2006 that should make it a significant year in our Force's history. USS *Florida* (SSGN-728) and USS *Michigan* (SSGN-727) will be delivered to the fleet after their conversion process from SSBN to SSGN, and the USS *Texas* (SSN-775), the second *Virginia*-class submarine, will also join the fleet in 2006. I wish a happy and healthy New Year to all of our Submarine Force men and women, and their families. BZ on a job well done in 2005, keep up the great work!

"2006 will be a year of focusing the Submarine Force's unique abilities as a functioning Enterprise on the transformational challenges of the evolving GWOT."

VADM Chuck L. Munns, USN, Commander, Naval Submarine Forces

As we look forward to an exciting 2006, let me recap some of the many achievements of the past year and set the scene for where we are headed in the near future.

- We commissioned USS *Jimmy Carter* (SSN-23) and for the first time hosted a living president on a naval warship named in his honor. The Submarine Force is fortunate to count as members President and Mrs. Carter – two individuals whose contributions to peace and humanity will be long remembered. President Carter's explanation for why we need this ship for creating peace reminded me of similar remarks I recall from Harvard University president and former Secretary of Treasury Lawrence Summers. He said "We are free, because we are strong, and that freedom depends on our strength."
- The newly commissioned USS *Virginia* (SSN-774) deployed ahead of schedule to the SOUTHCOM Area of Responsibility in support of counter-drug operations. Bringing *Virginia*'s capabilities to the Global War on Terror (GWOT) is a great example of our flexibility.
- 2005 was also notable for our international outreach and cooperation with other submarine forces. Our Diesel Electric Submarine Initiative involved Peru, Colombia, and Sweden and provided valuable ASW training services to our fleet. Submarine flag-level staff talks with Allied partners, exchange programs, and exercises such as Sorbet Royal 2005 were other venues of cooperation with an international submarine force that totals more than 225 submarines from 28 countries. Our NATO-led International Submarine Escape and Rescue Liaison Office (ISMERLO) had a supporting role in the rescue of HMCS *Chicoutimic* after her fire in 2004 and was critical in the recovery of the Russian *Priz* submarine when it was trapped underwater last summer.
- We expanded our UnderSea Enterprise (USE) by enlarging our Enterprise Flag Panel and addressing broader USE processes. I encourage each of you to be familiar with USE's history, structure, and procedures as outlined on pg. 4 and 5 of this issue, so you can understand your role and find ways to contribute.

The Submarine Force took delivery of our first SSGN, USS *Ohio* (SSGN-726), in December 2005. Her return to service this February and that of USS *Florida* (SSGN-728) later this spring are great success stories for demonstrating the power of the Enterprise model. To get the first SSGN back onboard required coordinated efforts across the entire USE. This on-time and on-cost delivery of *significant capability* required timely decisions from the TYCOM, Commander Fleet Forces Command, and Cross-Functional Teams that included representation from the PEO, NETWARCOM, numbered fleet commanders, SOCOM, Navy Installations Command, CNET, Naval Personnel Command, and others. Compared to the days when these decisions were made unilaterally by isolated organizations, we have come a long way.

In addition to seeing two SSGNs join the fleet this year, the Submarine Force will welcome the second ship of the *Virginia*-class when USS *Texas* (SSN-775) is commissioned in late summer/early fall. These new platforms and their incredible warfighting capabilities will quickly add to our ability to support the GWOT, conduct Phase Zero "scout" missions, and if needed, execute our part of the fight in major combat operations. We will continue to excel in these missions by going where others can't and "bringing home the bacon" day in and day out.

In January 2006, the Submarine Force proceeded further with our alignment efforts by combining SUBGRUs NINE and TEN under one flag officer and divesting the SUBGRU TWO commander of his Navy Region Northeast responsibilities. This will enable COMSUBGRU TWO to focus on his operational responsibilities: sending submarines to deployment and significantly enhancing our capabilities for, and contributing to, the GWOT.

2006 will be a year of focusing the Submarine Force's unique abilities as a functioning Enterprise on the transformational challenges of the evolving GWOT. I'm sure that by exploiting the pre-eminent capabilities of stealth, mobility, agility, and persistence inherent in our people and platforms, we will rise to the challenge and play a large role in our nation's security.

UNDERSEAWARFARE

The Official Magazine of the U.S. Submarine Force

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UNDERSEA WARFARE is the professional magazine of the undersea warfare community. Its purpose is to educate its readers on undersea warfare missions and programs, with a particular focus on U.S. submarines. This journal will also draw upon the Submarine Force's rich historical legacy to instill a sense of pride and professionalism among community members and to enhance reader awareness of the increasing relevance of undersea warfare for our nation's defense.

The opinions and assertions herein are the personal ones of the authors and do not necessarily reflect the official views of the U.S. Government, the Department of Defense, or the Department of the Navy.

Contributions and Feedback Welcome

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CHINFO Merit Award Winner

Silver Inkwell Award Winner

In keeping with UNDERSEA WARFARE Magazine's charter as the Official Magazine of the U.S. Submarine Force, we welcome letters to the editor, questions relating to articles that have appeared in previous issues, and insights and "lessons learned" from the fleet.

UNDERSEA WARFARE Magazine reserves the right to edit submissions for length, clarity, and accuracy. All submissions become the property of UNDERSEA WARFARE Magazine and may be published in all media. Please include pertinent contact information with submissions.

Send submissions to:

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dear EDITOR,

Edward C. Whitman's extraordinary account tracing the evolution of SOSUS [Sound Surveillance System], spanning many decades, was and is a remarkable example of both U.S. scientific experimentation and user domain application. I am indebted, as are others, to the article's publication and release.

I have felt for some time that the Navy's Undersea Surveillance Systems story, as your article portrays it, truly conveys the enduring legacy of a most important chapter that began with the Cold War but certainly does not and will not end there.

I should also mention that in 1951 I worked down the hall from then-Lt. j.g. Joe Kelly, who was mentioned in the article, at the Navy Department's Sonar Design Branch but did not, understandably, know what he was doing at the time.

Jerry Spigel

Mr. Spiegel,

Thank you for taking the time to write. This piece ["SOSUS: The Secret Weapon" of Undersea Surveillance," UNDERSEA WARFARE, Winter 2005], was Dr. Whitman's final article for the UNDERSEA WARFARE Magazine. He was the last remaining "plank-holder" on the magazine, having been part of the original editorial team that launched the magazine in late 1998.

You may be interested to learn that an expanded version of the article you enjoyed will constitute a chapter in a comprehensive history of anti-submarine warfare (ASW) that Dr. Whitman is working on with U.S. naval affairs expert Norman Polmar, who has contributed several articles to UNDERSEA WARFARE Magazine. The book will cover the whole evolution of the ASW business from about 1900 to the end of the 20th century. It is planned to be published in late 2006. Look for it!

CORRECTION: On page 15 of the Spring 2005 issue of UNDERSEA WARFARE, the submarine that participated in the Multi-Battle Group Import Exercise was USS *Albany* (SSN-753), not USS *Scranton* (SSN-756).

sailorsFIRST

U.S. Navy photo

Five submariners from the *Los Angeles*-class attack submarine USS *Helena* (SSN-725) spent a day at The Tonight Show with Jay Leno during a special tribute to all military members. The program was taped Nov. 23 and aired on Thanksgiving.

What's the U

The UnderSeaEnterprise Sets the Course

Today and the future

> Working with the other Type Commanders to develop the Common Readiness Model/common metrics
- Material/Maintenance, Personnel, Training, and Logistics Figures of Merit (FOM) to help describe readiness and cost

> Evolving Enterprise Metrics – MOPs
- Effects based
- Linked metrics – keyed to major processes

> Success in Action
- The first two SSGNs will be introduced to the fleet this year
- USS *Virginia* (SSN-774) completes a great first deployment
- Advances in the training process are providing better-trained submariners to the fleet faster
- Initiatives in maintenance processes are working to bring the same capability to the fleet faster and at less cost. SSN-22 Extended Docking Selected Restricted Availability was 60 percent shorter than SSN-21 – saved 224 days!

What is the UnderSea Enterprise (USE)?

The Undersea Enterprise is composed of all stakeholders and resources supporting or operating SSNs, SSGNs, SSBNs, fixed surveillance, or mobile surveillance forces. The primary elements of the Enterprise and its Resource Sponsors include dollars and manpower for current and future platform and crew readiness. Commander Naval Submarine Forces (CSF), the head of the Undersea Enterprise, sets the strategy, priorities, requirements, and overarching direction for suppliers, resource sponsors, and producers to ensure a quality product for the enterprise customers.

Structure

CSF's effects based management structure consists of a USE Board of Directors BOD, and supporting Cross Functional Teams (CFT). CSF leverages the USE structure to increase the productivity of delivering warfare capacity to meet operational demand. The USE BOD, by setting strategy and approving and monitoring metrics linked to personal accountability, uses CFTs to provide the integration of enterprise activities to meet USE objectives.

Overview of process structure:

> **Oversight** – USE Executive Committee (EXCOM): CSF, DCSF, OPNAV N77, OPNAV N13, DIR SSP, NAVSEA 00

> **Governance** – USE Board of Directors (see box on page 5)

> **Cross Functional Teams** – Integration:
- Maintenance / Sustainment
- Total Force Readiness
- Resources / Cost Management
- Operations

> **Sub Process Teams** – Execution: (some examples)
- Maintenance/Material - Warshot Reliability Action Panel, SUB TEAM ONE
- Personnel - Undersea Warfare Training Council (UWTC)
- Acquisition - USE Shipbuilding Strategy
- Operations - Tactical Requirements Group, SSGN Team

1994

Flag Panel created
- Major changes in OPNAV structure indicated a need to more closely link the efforts of a small group to improve production and maintenance efficiency for submarines
- Flag Panel created - COMSUBLANT, COMSUBPAC, OPNAV N77, NAVSEA 08

2000

New organizations report to the Flag Panel
- Submarine training organized under the Submarine Learning Center (SLC)
- Sub Team One (CFT) created to look at depot maintenance
- SUBWORKS CFT created to look at efficiencies in the class maintenance plan
  > Basic structure in place
  > Drumbeat of Quarterly meeting
  > No fleet metric

2003

Commander Naval Submarine Forces – COMNAVSUBFOR created
- Staff organization overhauled and functionally aligned
- SUBFOR created to oversee the enterprise

USE?

of the Submarine Force

Why was the USE established?

The Commander, Naval Submarine Forces, established an enterprise-wide governance structure to achieve the effective and efficient generation of combat power as directed by the Chief of Naval Operations (CNO) and the Commander, Fleet Forces Command (CFFC). The priorities of the USE are focused on key Measures of Performance (MOPs).

Examples of USE Cost-Wise Readiness initiatives...

> **Total Force CFT:** Total Force Readiness CFT: The group worked to refine submarine manning factors, which permitted a 9 percent reduction in officer accessions in FY04 and a 13 percent reduction in FY05 (a Military Personnel, Navy cost avoidance of $31.3M in FY04 and $72.3M in FY05).

> **Maintenance / Sustainment:** CFT Working to design out production cost, the team has initiatives in Production, Contracts, and Design to reduce *Virginia*-class submarine cost to $2 billion per ship (FY05 dollars).

> **Maintenance / Sustainment CFT:** Performance initiatives to eliminate 1,100 ship days lost to maintenance schedule overruns in FY05.

UnderSea Enterprise Measures of Performance (MOPs)

> **Operational Availability (Ao)** – "Around the World; Around the Clock" - Submarines and undersea surveillance assets deployed for sustained battle space preparation and deterrence

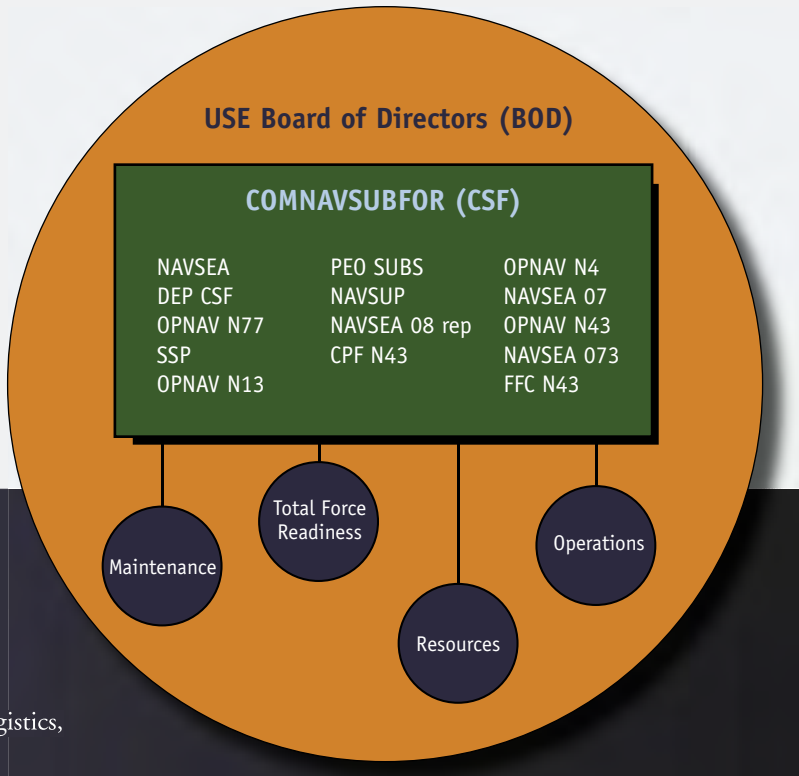
> **Improved Commanding Officer Decision-Making** – CO's making optimal decisions under the demands and complexity of the undersea environment

> **Submarine Expertise** – Experienced people integrated throughout the Joint war fighting, military technology and defense/government management communities

> **Culture/Standards/Conduct** – "Pride Runs Deep" – Assimilating new crew members into the submarine culture, while maintaining high standards and conduct

> **Future Capabilities** – Forecasting and meeting tomorrow's requirements for undersea superiority

For more information, visit the SUBLANT web site at www.sublant.navy.mil



2005

Enterprise Flag Panel created

- NAVSEA 00, OPNAV Fleet Readiness and Logistics, U.S. Fleet Forces Command, PEO SUBS added to Flag Panel to address broader UnderSea Enterprise processes
  - > Structure expanded
  - > Drumbeat of monthly meetings
  - > Fleet metric: Operational Availability

"**UnderSea Enterprise** – Maximizing Operational Availability in support of GWOT, Phase Zero, and Major Combat Operations"

by Mike Smith

Creating Opportunities

Naval Academy Commandant of Midshipmen Molds Future Warriors

Capt. Bruce Grooms, the 81st Commandant of Midshipmen at the U.S. Naval Academy, was commissioned in 1980 after graduating from the Academy with a Bachelor of Science degree in Aerospace Engineering. Among his many assignments, Capt. Grooms has served as the Executive Officer of USS *Pasadena* (SSN-752), Commanding Officer of USS *Asheville* (SSN-758), and as Commander, Submarine Squadron SIX. The 1999 winner of the Vice Adm. Stockdale Award for Leadership, he holds a Master's degree in National Security and Strategy Studies from the Naval War College and attended Stanford University as a National Security Affairs Fellow.

Photo by Airman Apprentice Clay Lewis

Capt. Bruce Grooms, Commandant of Midshipmen, U.S. Naval Academy.

Chief Petty Officer Johnny Bivera

Chief of Naval Operations, Adm. Mike Mullen.

"We need **leaders** for and from every part of our Navy. Our leadership should reflect the nation we represent. To the degree we are not diverse, we are weak."

Adm. Mike Mullen, CNO

USNA photo

Capt. Grooms recently sat down with the editors of UNDERSEA WARFARE Magazine to discuss several wide-ranging topics.

Q: What are your priorities as Commandant of Midshipmen at the U.S. Naval Academy?

A: My priorities as Commandant are really very simple; they are to give Midshipmen as many leadership opportunities as possible to prepare them to be good combat leaders. This also means making sure they act honorably and that their character has a solid foundation. We spend a lot of time working on those kinds of things. We also work to help them understand what is required of a good leader. Frankly, if we don't produce the best leaders, we won't be successful in the Fleet.

Q: Are those the priorities you came onboard with, or have they been shaped by your time in office?

A: I think in general – and one thing I've found – is that this institution has been around for 160 years, and I don't know that I've come up with any great new priorities. Our mission, our vision – what we are fundamentally here for – all of those things are really the same. And so I am really here in a caretaker status to make sure we support and continue to do those things. I would love to be able to say I came up with a brand new list of bigger, better, more important things. The reality is that this is a really solid institution, and those things which we stand for are the things which our predecessors stood for long ago, and are the things I believe in. I'm here to make sure we continue to do what we are chartered to do.

Q: While any command position is difficult, submarine commands have many unique challenges. What experiences from your submarine career will influence your leadership style at the Academy?

A: I think my experiences as a submarine officer mirror almost any other challenge that I have had. You have machines which are designed to do things; you have buildings in which important things happen – but after all is said and done, it's really about the people who run those machines, the people in the buildings, and what you do with those folks and how you work together to get the most out of them. In my submarine experience, I've been to places where the submarine and its crew excelled, but it excelled because there was a small percentage of folks who did almost everything, and there were a lot of other folks whom we sometimes called spectators. I have been in other submarines where – however it happened – we managed to get a much larger group of folks who were energized and wanted to do the right things; and those submarine commands performed superbly. The good news is that we have a bunch of great folks. The challenging news is that we have to get those great people to work together towards common goals – and that is identical to the Naval Academy with one minor exception.

That exception is the Midshipmen – a group of folks with the brightest, most creative, and energetic minds and sometimes it takes a lot more work to corral that energy and those minds, because they are just waiting for chances to do things. So you can't lead Midshipmen as you might lead people in the Fleet. You can't just dictate and decree and say, "Thou shalt." You actually have to figure out ways to make the Midshipmen a part of everything that goes on here, and then if you are fortunate enough to be able to mold, and corral, and get them going, you'll have success. From my standpoint, having been on the job for four or five months, it is a work in progress. All these great minds are bubbling, kind of like popcorn, just kind of popping, waiting to break out of the bag. So I think that is my personal challenge – to help shape and mold them.

Q: What do you see as the most exciting development in the submarine

community that Midshipmen going through school now will have to look forward to in the Fleet?

A: This is really kind of a neat story. We have these great machines that are stealthy, they have endurance, and have long dwell times and are able to go places and do things that we were not able to do 20 or 30 years ago. We now have systems that help us do all of those things so much better. We now have much improved communications; we have unique high-frequency sonar systems that help us see through the ocean environment better, we have the ability not only to be stealthy – but also to work in unison with SEALs and our Advanced SEAL Delivery System. So now we can be there and have specialists go to places and do things. We have intelligence gathering systems that are so much better than they were years ago, and so we can collect information and contribute. So for the incoming Midshipmen and future submarine officers, it is all about being able to do all those important things so much better. The Global War on Terror and other challenges place an even greater premium on the submarine's enduring qualities of stealth, endurance, agility, and firepower.

We sent a group of Midshipmen out to visit the USS *Virginia* (SSN-774) recently. Here we have this submarine that can do it all, and the comments I received from each and every Midshipmen was, "We had no idea that submarines were so capable."One of the things we don't do quite as well as we ought to in the submarine world is to advertise and make clear that there are some neat challenges and that the Submarine Force really does contribute to the combat readiness of our Navy. It has been a "silent service" for a long time, and we don't publicize what's out there and what we can do. And that is sometimes a challenge.


USNA Photo

Q: How important is diversity to the Navy? From your position now, what can you do to promote diversity in the Submarine Force?

A: I think, in general, diversity is important. But I think from a broader view, the world and this country are made up of two kinds of people. One is the group who has opportunities; and then there are the people who need opportunities. Frankly, we have no shortage of places for good people in the Navy, government, and service in general, so there are tons of opportunities out there, and for those who have them, you should take advantage of them. The diversity that is so important is giving other folks the chance to do great things. It is not to create particular set-asides or any of those kinds of things. It is about giving opportunities – and when you do provide them, you find that there are a lot of other people who are equally capable and can contribute to the good of the service and our cause. That's what it's really all about – getting the best out of the most people we can and not limiting those who might not otherwise have opportunities. So here at the Academy, it is important to have a broad spectrum and so I think I can contribute most by just being here, and not making any particular push. Just by being here may inspire some to say, "Gee, I would like to be like him. Not because of any particular 'diversity,' but because I think he's a capable person."

Q: You were awarded the Vice Admiral James Bond Stockdale Leadership Award, which recognizes leaders for their qualities as moralists, jurists, teachers, stewards, and philosophers. You obviously excelled in each of these categories. What quality do you see as the most valuable to a submarine officer and why?

A: It was certainly an honor to win the Vice Adm. Stockdale award and – in my view – it wasn't because I was particularly special. I can probably tell you twenty stories about things that happened in my command tour that were sort of special. But I guess the couple of things that were truly special to me were that as a ship and a command we didn't win a whole lot of individual awards. However, we won almost every organizational award, and we won them because we had this group of folks who were all committed to the same things. I think I used the majority of my time trying to broaden the perspective of people who were willing to do more.

Our boat was noted for a couple things. We were called the "second-chance boat". We had a half-dozen Sailors who were thrown off their boats for whatever reason, and they were probably soon to be thrown out of the Navy. For some reason – maybe I was asked, maybe I volunteered, I don't remember exactly – we embraced every single one of those Sailors and took them to be a part of our crew. And the challenge was getting the crew to recognize that these new crewmembers really did have a lot to contribute. It turned out to be a positive-positive because even though they had somewhat bad reputations when they came aboard, they wanted a second chance, and they were willing to work harder. The rest of the crew saw that they were trying to do the right thing, so it just developed into a team effort.

The other part of it was that we had this program that we called "The Square Peg/ Round Hole Program", and as it turned out, and I think I learned this long ago – if you have a crew of 150 people, you will find that each of those 150 Sailors has an individual talent. Their particular skill may not be as the best submarine driver, sonar tech, or torpedomen. It is important to have those submarine skills, but it's also important to tap into whatever it is that each of these individuals is capable of doing, both on and off the boat. I've found that there were always Sailors who didn't come forward with their special skills. You have to find ways to figure them out by cultivating an environment and culture that causes folks to come forward. Once they feel comfortable coming forward, you never know what kind of benefits they can bring to the boat.

I remember one case where we were out operating on a mission in the most challenging place known to man, and the water was shallower than I would have liked, and the environmental conditions were horrible, and then on top of that, there was this huge fishing fleet over us that posed a great challenge as well. As it turned out, two of my crewmembers had spent their entire childhood and adolescence as oceangoing, seagoing, littoral-environment fisherman. And so as we were struggling to get from point A to point B, I asked, "Hey guys, I'm no expert on this. I need some help figuring out where we ought to go." Certainly

USNA photo

there were some tactical parts to this that I could figure out pretty easily. After my announcement, a few crewmembers came forward and pulled out the charts and the maps with the fishing vessel traffic, and they said, "Sir, if you go this way through here, just based on the water, the time of day, the geography, etc. our experience tells us it's going to work." I said, "Thank you very much," and we did just what they recommended, and we ended up just where we needed to be while avoiding all the hazards.

As fate would have it, we were able to successfully carry out the operation. Now these crewmembers were wonderful Sailors, but they would not necessarily have come forward unless we had communicated our needs to them and given them the opportunity to contribute in their own unique way. Because of this, we all won, and that was a big part of the success of our boat. And now I'm trying those things here – creating opportunities to contribute.

Finally, if all else fails, take the time to listen to people. It is amazing what they'll tell you if you actually take the time to listen. We all know how to speak, how to pontificate, how to wag our fingers, but often times we don't know how to listen. People will only transmit pulses for a little while, and if they don't get a return, they'll be happy to stop transmitting – and shame on us for not listening and benefiting from what they had to offer.

Q: Based on your career thus far, what advice would you give an incoming Midshipmen or junior Sailor who has just joined the Submarine Force?

A: My advice to Midshipmen – my advice to anyone – would be this: life is really much simpler than we sometimes make it out to be, and the things necessary for success are sometimes the small ones. Think of the Naval Academy as Mount Everest. How do you climb it? The way to do it is very simple. First, set the goal of making it to the top. The next step is to understand that nothing comes naturally, so you have to prepare yourself by doing the absolute best that you can. This applies at the Naval Academy, in the Fleet, and in general. You need to study, work hard, and prepare yourself as well as you can. Third you need to take things one step at a time – from induction day to graduation, from commissioning to retirement, it is all about taking one step at a time. Finally, it is all about not quitting, having endurance, and sticking to it. Once you set out and start taking those steps, no matter how hard it gets along the way, remember that there's a lot of reward at the end, and you'll never see those benefits if you don't endure.

So, really, those four steps – nothing mystical and nothing magical – is what life is all about for Midshipmen or young officers. I can tell you that after graduating and on my way to my first submarine as an ensign, I had some real challenges. Frankly, if it hadn't been for them, I probably would have moved on to something else. Instead, I decided I would go on to the next step, because it had to get better. In my own case, it got better each time. Each assignment was better. When I look back, I'm glad I had those challenges, but more importantly I'm glad that I endured each of them to reach this wonderful point in my career.

Mr. Smith is the Managing Editor of UNDERSEA WARFARE Magazine and an analyst with Anteon Corporation in Washington, D.C.

Ms. Anna Ward, Personal Secretary to the Commandant

Q: When you were informed you had another submariner as the commandant, what was your reaction?

A: I was pleased to learn USNA was receiving another high-level submarine officer. I have worked with several submarine officers in the past and know their personalities are strong-willed. They are determined to perform their job above and beyond what is expected. However, when selecting someone for the position of Commandant, I don't believe it is because of their warfare community, but rather it is their leadership style and personal ability to successfully train and lead the Brigade of Midshipmen. Capt. Grooms is a superb leader and addition to USNA.

Q: How does the staff react to Capt. Grooms?

A: The staff thinks he's great and fully respects him; not just as an officer and the Commandant, but as gentleman. He has an approachable management style.

Q: How do the Midshipmen react to him?

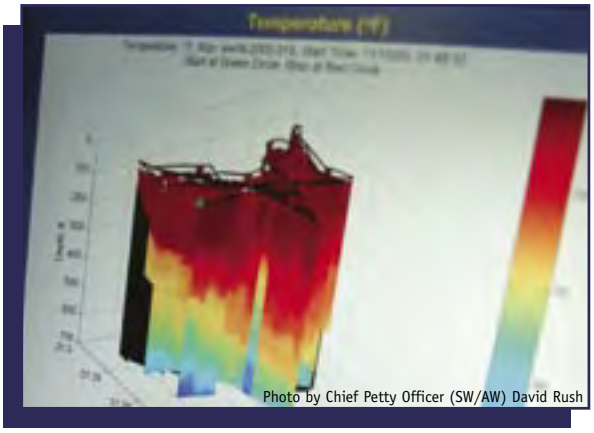
A: Some of the Midshipmen are a bit nervous around him. As Capt. and Mrs. Grooms continue to get settled into their lives here at the Academy, they are able to meet and entertain Midshipmen, which allow the Midshipmen to realize how loving and kind the Grooms truly are.

Q: Is there anything you would like to add?

A: I consider it a great privilege to work for the Commandant of Midshipmen and to be involved in the day-to-day training of the Midshipmen, especially during this particular time in history, with war and natural disasters affecting our global community. I feel confident the men and women attending and graduating from USNA under the leadership of Capt. Grooms will be well prepared to lead the Fleet and serve our country and the world community.

by Chief Petty Officer (SW/AW) David Rush, USN

Submarine Makes First Launch of an Underwater Glider



(above) The Slocum glider gathers various information including seawater temperature (seen here), salinity, and current speeds and can also record and transmit audio and video information.

(top right) The Slocum Glider, the first underwater glider launched from a Dry Deck Shelter, is retrieved following a five-day test. The Slocum Glider, named after Joshua Slocum, the first man to single-handedly sail around the world, looks like a mini-submarine.

In a first for the U.S. Navy, an underwater glider was launched with the aid of Navy divers from the Dry Deck Shelter onboard USS *Buffalo* (SSN-715) on Nov. 14.

The glider is a uniquely mobile network component capable of moving to specific locations and depths, occupying controlled spatial and temporal grids. Driven in a saw tooth vertical profile by variable buoyancy, the glider moves horizontally and vertically.

It gathers various information including seawater temperature, salinity, water clarity, and ocean current speeds. The information is transmitted on a predetermined interval when it surfaces, to computers via satellite phone. Data is collected on compact flash cards, just like the ones used for digital cameras.

Named after Joshua Slocum, the first man to single-handedly sail around the world, the Slocum glider looks like a mini-submarine. It is battery powered and has removable wings and a controllable rudder.

Photo by Chief Petty Officer (SW/AW) David Rush

Lt. Cmdr. Patrick Cross, COMSUBPAC Force Oceanographer, said the information that this type of device provides is invaluable to the Navy. "Our interest in the Submarine Force has been to use these to characterize the ocean. They're equipped with sensors that can give us salinity and temperature versus depth, and from that we can get sound speeds [rate at which sound from a source travels through water]. We can feed that data into our MODAS [Modular Ocean Data Assimilation System], run by the Naval Oceanographic Office, and that provides a picture that we provide to our submarines," said Cross.

As for what the information means to those assets below and above the ocean, Cross added that it paints a picture that can be used to their advantage. "It's basically a three dimensional depiction of ocean conditions that is used in tactical decision aides to determine sonar performance," said Lt. Cmdr. Cross.

Lt. Cmdr. Cross said that the gliders are an easy and effective way to gather important data. "The gliders are a great way to have a persistent sensor out there to continuously feed us data on what the ocean is doing. Then we can feed that to our shore-based computer models and get a better picture of the ocean. We can give that information to all tactical assets, not just submarines but anyone involved in ASW."

Lt. Cmdr. Cross added that the gliders have demonstrated their capability in various exercises. "We have had incremental success since we began using them in exercises, including a glider in RIMPAC '04. It did a great job of demonstrating the technology.

Retrieving a glider via submarine is a logical next step. "One of the future exercises we hope to do is recover a glider onboard a submarine, demonstrating both deployment and recovery. We would locate the glider via GPS and divers would retrieve it and bring it aboard," Lt. Cmdr. Cross concluded.

Webb Research Vice President Clayton Jones said the launch was an important step in the right direction. "This is a milestone. It's the first time we have deployed a glider from a DDS (Dry Deck Shelter). This program will spark interest in those who are pursuing this kind of technology. Frequently you know the areas where you want to work in, so you can get this in there and get an environmental assessment without anybody in harms way," said Jones.

The gliders are relatively inexpensive, easy to reconfigure for various missions, and have a long life span with minimal maintenance. When new batteries are required they can simply be replaced and the glider can be put back in the water again.

The recent test involved inserting the glider into the water from the DDS onboard *Buffalo* and then letting it gather and transmit information for five days in an area off the Southwest coast of Oahu, Hawaii.

Jones, along with Lt. Cmdr. Cross and Elizabeth Creed, Senior Scientist, Oasis Inc., departed Pearl Harbor Nov. 18, on a torpedo recovery boat to retrieve the glider.

They used the GPS coordinates sent from the glider to find its location, and upon surfacing, Creed commanded the glider via computer to remain on the surface.

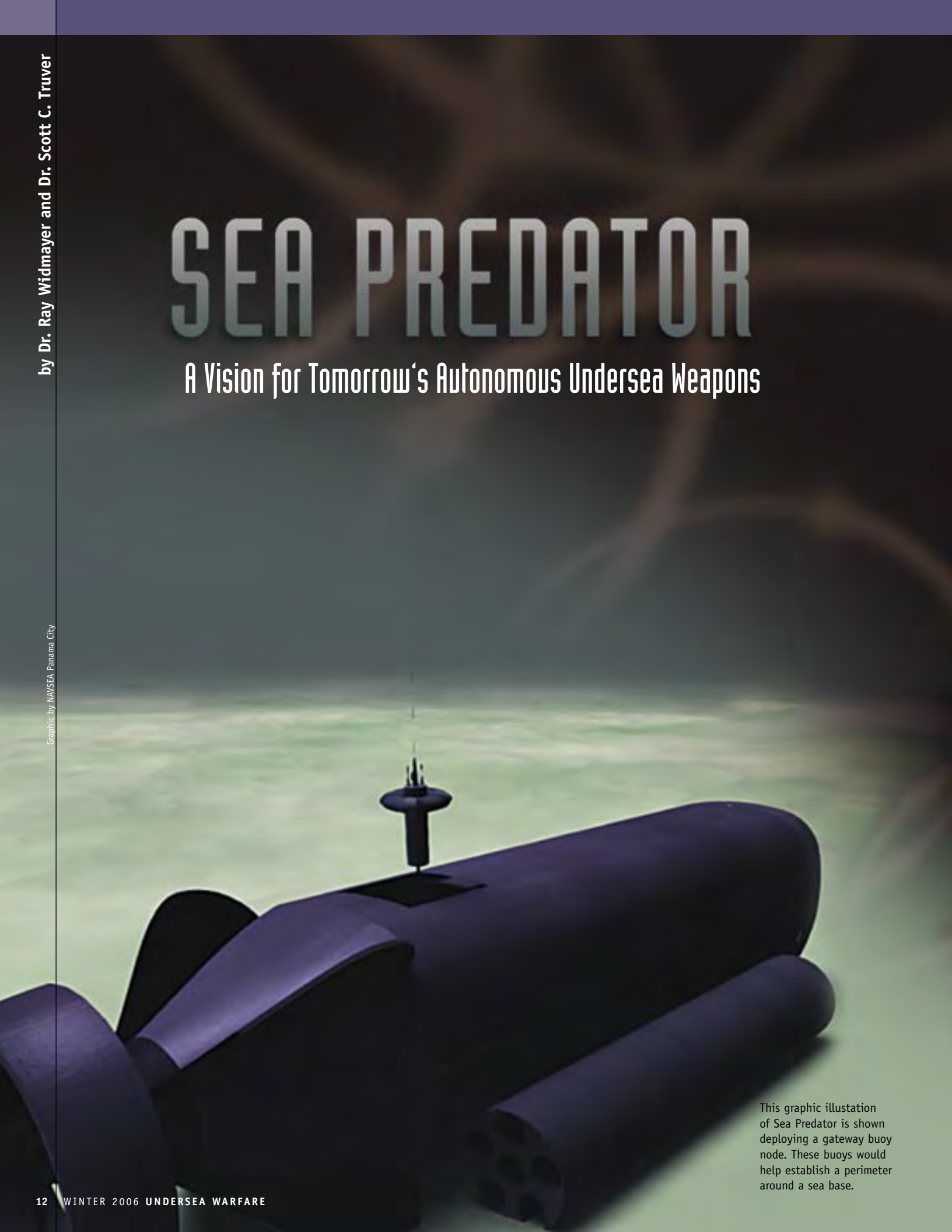
According to Creed, the event went very well. "I got this one ready to operate and have been compiling the data for the last week. Things have gone extremely well. Many milestones have been met and everything we have set out to do was accomplished, so it has been very successful," he said.

Chief Petty Officer Rush serves in the COMSUBPAC Public Affairs Office in Pearl Harbor, Hawaii.

SEA PREDATOR

A Vision for Tomorrow's Autonomous Undersea Weapons

by Dr. Ray Widmayer and Dr. Scott C. Truver



Graphic by NAVSEA Panama City

This graphic illustation of Sea Predator is shown deploying a gateway buoy node. These buoys would help establish a perimeter around a sea base.

QUESTION: What weapon can meet all of these demanding challenges? One that:

- to be operational after deployment, requires no person in the loop
- can be located many miles from any manned ship
- will wait patiently, possibly for months, until the enemy approaches
- will attack with great success when the enemy does appear
- upon the end of a pre-determined lifetime, will automatically sterilize, rendering itself harmless
- serves as a force multiplier, reducing the number of manned platforms required

ANSWER: *Today's sea mine*. And mines have been doing these things since World War I. And even before then! Very well!

- Sea mines were the "torpedoes" that Rear Adm. David G. Farragut damned in 1864 during the Civil War Battle of Mobile Bay.
- Sea mines were the weapons that were used as a North Sea blockade to German U-Boat transits in World War I.
- Sea mines were the weapons that sank or severely damaged some 3,000 Axis ships in World War II, and were the weapons that nearly strangled Japan in the closing months of that war.
- Sea mines were the weapons that helped bring North Vietnam to the negotiating table after the blockade of Haiphong Harbor.
- Sea mines were the weapon of choice in attempting to block the Strait of Hormuz and spiking oil prices during the 1987 tanker war.
- Sea mines have damaged more U. S. ships than any other maritime weapon since the Korean War.

In fact, sea mines were the world's first autonomous, unmanned weapon – the first military robots. Even today, defending against the sea mine stimulates all the effort now underway in the U.S. Navy's mine countermeasures area and at least one shipbuilding program. Extremely lethal, easy to use – even by a country with little other naval warfare capability – sea mines are exceptionally difficult to counter, even with the sophisticated mine countermeasures systems the U.S. Navy and America's coalition partners, allies, and friends are developing.

Notwithstanding all of these strong attributes, the Navy's willingness to use sea mines has diminished over the years because of a number of negative "associations" – some real and some perceived. For example, many believe:

- the use of sea mines is militarily and politically provocative;
- it takes an excessive number of delivery sorties to plant an effective minefield;
- mines can restrict our own platforms' freedom of maneuver;
- mines require an excessive level of effort to remove after the mission is complete;
- the rules of engagement are too restrictive; and
- that sea mines are only used by belligerent rogue countries.

So the *real* question is how the Navy can capitalize in the future on the unique, battle-proven capabilities of past and current sea mines – to provide a lethal option for future littoral warfare in full consonance with the political and military demands of modern, joint-warfare operations. The answer is to embrace available sea mine technology but in a totally different – and "transformational"- manner than employed previously. The result will be a new, networked sea-mine weapon system able to support 21st-century joint forces in ways that will produce only positive results, without the negative associations summarized above. In fact, the transformational mine-like weapons of the 21st century may not be mines in the classic, conventional sense at all; they may actually be mobile, unmanned undersea weapons – "Sea Predators" – tirelessly on duty protecting the Fleet.

An incipient Navy program for the 21st century, the Sea Predator mine will take advantage of the basic mine characteristics that have served so well for so long – high-lethality, long-endurance, man-out-of-the-loop, strong psychological impact, and force-multiplying features that free manned platforms for other duties – to name a few. Sea Predator, however, will also exploit 21st-century technology to achieve autonomous UUV-like mobility, remote control, and exceptionally large damage width. Further, Sea Predator will be fully networked within the FORCEnet of distributed sensing and command-control-and-communications (C3) channels under development within the Navy.

FOUR BASIC QUESTIONS NEED TO BE ANSWERED ABOUT THIS PROPOSED SEA PREDATOR:

- Why do we need a Sea Predator mine in the first place?
- What are the operational requirements?
- What are the technology enablers?
- What is the way ahead?

The Need for Sea Predator

Among the Naval Power 21/Sea Power 21 pillars of Sea Basing, Sea Shield, and Sea Strike – combined with the overarching FORCEnet – Sea Basing is the central axis around which the others revolve. Although it eliminates the difficult defensive issues


Graphic by NAVSEA Panama City

This graphic illustration shows a future concept of the Littoral Combat Ship launching the Sea Predator.

associated with a land base, the Sea Base (typically some 50 x 50 nm or larger in size, located 100 nm or farther off shore) is unfortunately prey to a whole new array of enemy threats, primarily those associated with diesel submarines, fast swarming boats, and mines – in addition to vulnerability to air attack. Protection of the Sea Base is therefore fundamental to successful military operation there. Without the Sea Base, the other pillars are meaningless.

If the most lethal threat is the enemy submarine, protection of the Sea Base is a perfect job for the Sea Predator mine. In fact, while not specifying any particular weapon system, the approved *ASW Concept of Operations (CONOPS)* of December 2004 virtually prescribes a mine-like system – like Sea Predator – as a key player defending the Sea Base from future submarines. Sea Predator fits the ASW CONOPS like a glove – not as the only player, but certainly as a key element of the ASW team protecting the Sea Base.

Specifically, the ASW CONOPS observes that *"limitations in current weapons reach and sensor integration drives many of today's ASW operations toward 'force on force' engagements that place our forces at risk." The CONOPS goes on to indicate that "our intent is to apply network centric warfare to dominate the environment by using unmanned vehicles, common operating pictures, and stand-off precision weapons."* The CONOPS continues in noting that in the future, ASW will shift from *"platform-intensive" to "sensor-rich"* operations.

Similarly, another recently promulgated planning document, the *Navy Unmanned Undersea Vehicle (UUV) Master Plan*, (approved Nov. 9, 2004) supports the case for Sea Predator for protection of the Sea Base by advocating major roles for UUVs in the future of undersea warfare. The use of UUVs as launch platforms for weapons – which could protect the sea base – is identified, thereby providing the capability *"to deliver ordnance to a target with sensor-to-shooter closure measured in seconds rather than minutes or hours."* As with the ASW CONOPS, Sea Predator is not specifically identified in the UUV Master Plan, but the fit is obvious.

Operational Requirements

Unquestionably, the Sea Predator mine must be capable of remote command and control – e.g., it must have the ability to be turned off, turned on, sterilized, and have operational settings changed remotely. The reason for this inescapable RECO (Remote Control) requirement is that tactically, the Sea Base must be easily movable, with ready access for "blue-force" and friendly ships. The use of Sea Predator must not restrict the maneuver or the structure of the Sea Base in any way. Additionally, in uses other than Sea base protection, RECO would provide tactical control of Sea Predator (and conventional in-service mines as well) to allow turn off, turn on, or alterations in actuation characteristics. This feature would allow the laying of minefields before open hostilities, with subsequent "arming" by remote control whenever dictated by the national command authority.

Another firm requirement for Sea Predator would be a capability to function as a weapon "node" within the FORCEnet sensor/communication grid of the Sea Base or any other undersea area. This will complement other assets in protecting the perimeter of the Sea Base from the threat of diesel submarines or swarming small boats, or in other more conventional sea control applications.

These considerations lead to an additional key requirement. Guarding the perimeter of a Sea Base – on the order of 100 or 200 miles – simply does not allow the use of older, conventional 20th-century explode-in-place mines, because their damage width is too small (no more than several hundred feet per mine). The 21st-century Sea Predator must therefore provide a very wide damage width (several miles) that can cover the perimeter of the Sea Base or other operational areas with limited numbers of Sea Predator "weapon-nodes." This requirement naturally leads to self-propelled, torpedo-like warheads for Sea Predator. Sea Predator must also be capable of "time-critical strike," attacking multiple targets in quick succession with a minimum detect-to-engage timeline.

Finally, to not constrain the location of the Sea Base, Sea Predator must be operable in a wide variety of water depths, from those of the continental shelf (200 meters and less) to the deeps of the open ocean.

To satisfy these top-level requirements, Sea Predator will therefore have the following notional capabilities:

- Be carried aboard and launched from ships indigenous to the Sea Base or other operating areas – for example, from the Littoral Combat Ship (LCS), submarines, or amphibious ships.
- Carry multiple, self-propelled warheads;
- House C3 systems for interface with FORCEnet, the Sea Predator commander, and the mobile warheads, themselves;
- Include a means of propelling itself from the launch ship and returning (e.g., for re-arming with mobile warheads, or for movement of the Sea Base itself).
- Have a capability of hovering in place for long periods of time, and/or sitting on the sea bottom; and of maneuvering to other similar station-keeping locations.

Technology Enablers

The key to fielding Sea Predator is will be the exploitation of several emerging technologies and systems. Three of these required for Sea Predator are:

- distributed sensors and associated C3 capabilities (FORCEnet);
- a compact, lethal, and long-range self-propelled warhead; and
- an unmanned vehicle to launch and control the self propelled warheads

The good news is that there are strong technology and development programs now underway within the Navy in each of these three enabling areas that are particularly well- tailored for the Sea Predator application.

The bad news is that in all such technology programs, there are elements of risk, and there is no guarantee that the advances needed for Sea Predator will be available in a timely manner. Risk-reducing programmatic backups are needed.

The best approach for Sea Predator is to structure a composite program that supports the continuation of the three required technology/system efforts (FORCEnet, self-propelled warheads, and UUVs) both directly and indirectly so that they mature to a level that is useful for Sea Predator in a timely manner. This entails both funding some aspects of Sea Predator directly and ensuring that momentum is maintained in evolving the supporting technologies/systems under other efforts. Clearly, Sea Predator must be more an integration effort than a development program.

By far, the biggest technology challenges for Sea Predator rest on the viability of FORCEnet targeting and communications. In this regard, the on-going Sea Web technology program offers great potential for contributing to Sea Predator's overall C3 needs. Additionally, while several distributed-array sensing systems are also in development (e.g., the Advanced Deployable System (ADS) and Distributed Advanced Detection System (DADS)), these are bottom-located and therefore depth-limited. Early-stage programs such as the ONR "Plus-Net" system – which uses UUVs as sensor platforms that are not depth-limited – are 10 years away from Fleet introduction, at best. And of course, bandwidth is always an issue.

Another major challenge is the self-propelled warhead. Today the only in-service self-propelled warheads that might be used in Sea Predator are the lightweight torpedoes – Mk 46, Mk 50, and Mk 54. Expensive and relative large, these weapons are not nearly optimum for Sea Predator, particularly when rapid, multiple attacks are needed against such threats as swarming boats or multiple diesel submarines attacking a Sea Base. Fortunately, another smaller, torpedo-like weapon is in the later stages of development – the Anti-Torpedo Torpedo (ATT). The ATT is being developed as a surface ship self-defense weapon to provide a counter to in-coming enemy torpedoes, and it is only 6.75 inches in diameter. Based heavily on ATT, an exciting new program called the Combat Rapid Attack Weapon (CRAW) is essentially a "souped-up" ATT with a new anti-submarine and/or anti-surface warhead. CRAW would be an ideal mobile warhead for Sea Predator, with a development schedule suited for Sea Predator use (circa 2015).

Finally there is the autonomous mobility aspect of Sea Predator – the "mother" UUV that will be used to autonomously transport, house, and launch the self-propelled warheads. In consonance with the UUV Master Plan, the Submarine Community is in the process of initiating development of a new, large UUV intended as a "truck" to haul a variety of payloads. This UUV, called the Large Displacement Mission Reconfigurable UUV (LD MRUUV), could well be as large as 4 or 5 feet in diameter, or it could even be rectangular in configuration. A concept formulation process is underway to specify LD MRUUV more definitively, but without question, there is great potential here for use as the autonomous delivery vehicle for Sea Predator.

Again, the key to Sea Predator is technology integration – leveraging other programs and resources to create the Sea Predator weapon system. The Sea Predator development program must encourage and contribute materially to the success of each of the three main Sea Predator components – FORCEnet, self-propelled warhead, and LD MRUUV.

Managing Risk

Where there is technology development, there is risk; and where there is risk, backups are required. Although expensive and sub-optimum for rapid multiple launching – but clearly lethal – the existing lightweight torpedoes (e.g. Mk 54) could provide an interim Sea Predator self-propelled warhead capability should the self-propelled warhead (CRAW) program face difficulties. Similarly, the in-service Swimmer Delivery Vehicle (SDV) could conceivably be modified to form a UUV to carry and launch the Sea Predator

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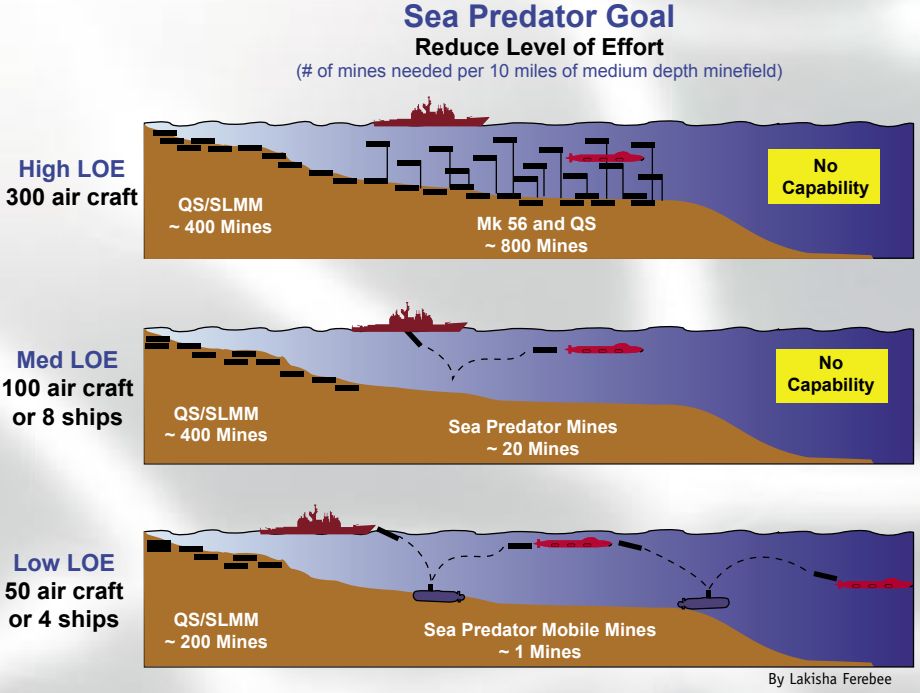


This graphic illustrates the number of mines needed per 10 miles of a medium depth minefield. Sea Predator greatly reduces the number of mines needed to cover such an area.

Photo by Chief Petty Officer (SW/AW) David Rush

(left) A Sailor from USS *Key West* (SSN-722) greets his wife and newborn child for the first time upon his return from a six-month Western Pacific deployment.

(below) USS *Key West* (SSN-722) returned from a six-month Western Pacific deployment to its homeport of Pearl Harbor Nov. 10. The submariners of *Key West* participated in Talisman Sabre, and during their deployment had the opportunity to visit Australia, Japan, and Guam.

Home

Photo by Chief Petty Officer (SW/AW) David Rush

Photo by Lt. Mark Jones

Photo by Chief Petty Officer (SW/AW) David Rush

(left) A Sailor aboard USS *Tucson* (SSN-770) makes final preparations before getting underway from its homeport of Pearl Harbor on Oct. 11, to participate in a Combined Training Unit Exercise (COMPTUEX) off the coast of Southern California. For approximately three weeks, the nuclear-powered attack submarine's crew conducted various Anti-Submarine Warfare (ASW) and Intelligence, Surveillance, and Reconnaissance (ISR) exercises as an asset of the USS *Ronald Reagan* (CVN-76) Carrier Strike Group.

(far left) USS *Miami* (SSN-755) pulls into her homeport at Submarine Base New London. *Miami* completed a regularly scheduled deployment in support of the Global War on Terror.

for the Holidays

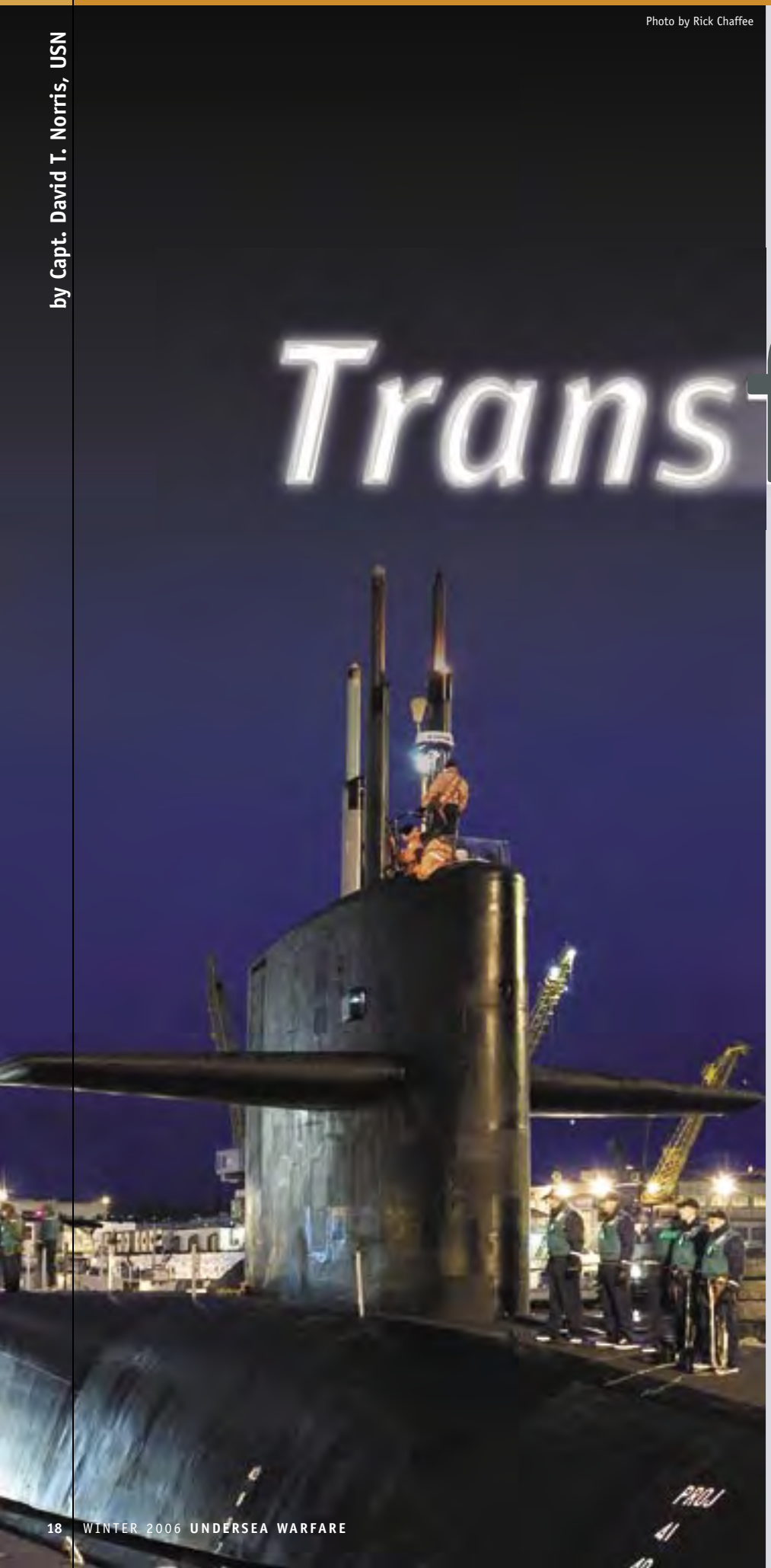
Submariners Return Home from Deployments and Training

Photo by Chief Petty Officer (SW/AW) David Rush

(right) Following a six-month deployment to the Western Pacific, USS *Louisville* (SSN-724) returned to its homeport of Pearl Harbor on Nov. 16. The Los Angeles-class submarine departed Pearl Harbor on May 16. During its deployment, the submarine visited Yokosuka, Japan; Brisbane, Australia; Guam, and Saipan.

by Capt. David T. Norris, USN

Photo by Rick Chaffee



USS *Ohio* (SSGN-726) returns to PSNS & IMF with a broom atop her sail after completing a "clean sweep" of her sea trials. *Ohio* is the first ballistic missile submarine to complete conversion to the new class of guided missile submarines (SSGN).

Transforma

Comes to

If there is one constant within the Submarine Force, it is continual adaptation and transformation to meet emerging needs. Before World War II, for example, most people thought of submarines only as scouts for locating hostile forces and then finishing off enemy ships that the surface fleet had already damaged. For many months after the attack on Pearl Harbor, however, submarines were virtually the sole offensive weapons remaining in the Pacific Fleet. Moreover, during the rest of the war, submarines added Special Forces operations, Intelligence, Surveillance, and Reconnaissance (ISR), and shore attack to its anti-shipping missions.

With the end of World War II, the Submarine Force once again adjusted to meet the needs of an unpredictable conflict – the Cold War. The most significant difference between the Submarine Force of the 1940s and that of the Cold War was its role in strategic deterrence. First with cruise missiles and then ballistic missiles, the Submarine Force became a part of the Nuclear Triad that helped to ensure the United States' security in an uncertain era. This mission required a new type of ship, which first appeared with USS *George*

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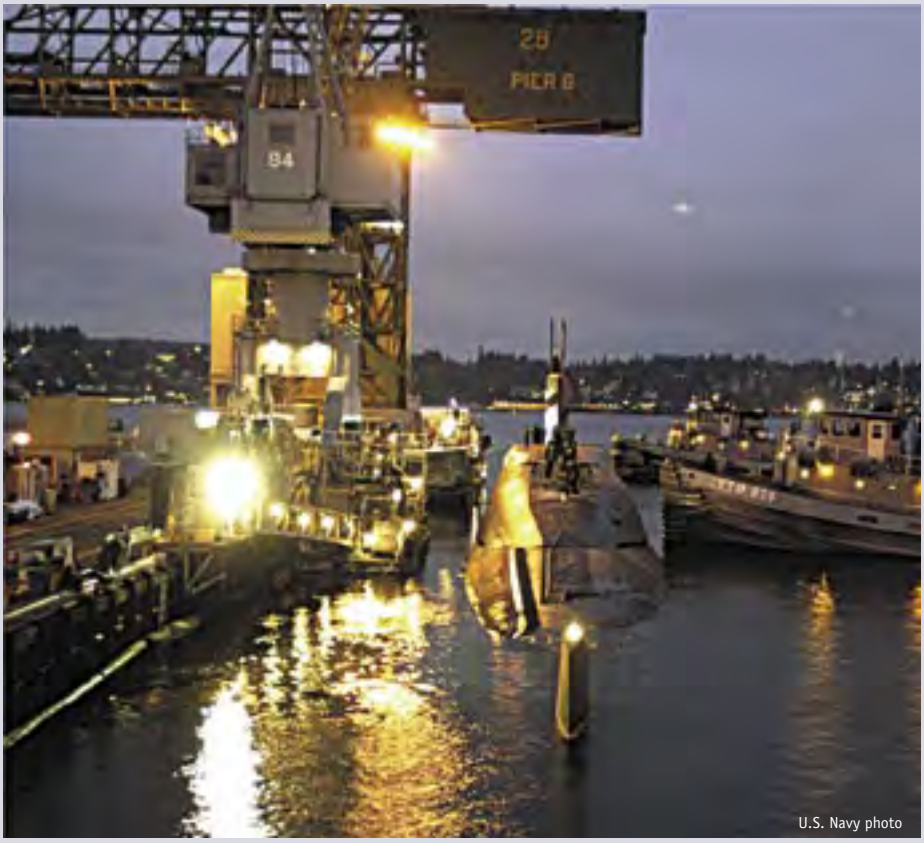
the Fleet



U.S. Navy photo

Washington (SSBN-598) – the first Fleet Ballistic Missile Submarine – and later culminated in the USS *Ohio* (SSBN-726)-class. Also during the Cold War, attack submarines added the capability of power projection ashore with the TOMAHAWK cruise missile.

The Submarine Force is once again enhancing and expanding its capabilities. SSNs are still the premier anti-submarine and anti-ship platforms, but they are also uniquely adept in clandestine ISR, Strike, and Special Forces roles. The *Ohio*-class SSBNs continue to provide survivable nuclear deterrence, but today, the first four *Ohio*-class SSBNs are being converted in a transformational program that will further expand the capabilities of the Submarine Force. The first of these ships, *Ohio* herself, completed her engineered refueling overhaul and conversion in December 2005. The conversion modifies one of the world's most capable ballistic missile submarines into the world's most powerful undersea Strike and Special Forces platform. The SSGN is the latest manifestation of the Submarine Force's ability to adapt to meet current and future needs.

The modern SSGN concept began in 1994 when the Nuclear Posture Review determined that the United States needed only 14 of its 18 *Ohio*-class SSBNs. Therefore, the four oldest, USS *Ohio*, USS *Michigan* (SSGN-727), USS *Florida* (SSGN-728), and USS *Georgia* (SSGN-729) were slated for inactivation, despite a combined eighty-plus years of operational life remaining in their hulls. The significant cost of new submarines, the remaining service life of the four ships, and the tremendous payload capacity of the *Ohio*-class were all factors that led to further consideration of the inactivation decision.

In 1999, Congress approved funding for a concept study on converting the four SSBNs slated for decommissioning into Strike and Special Forces platforms. From that point on, the Navy moved quickly with strong Congressional support to transform the first four *Ohio* submarines from the ultimate Cold War weapon to a state-of-the-art, 21st-century warfighting platform. In 2000, Congress provided funding for a design study and in 2001, approved the additional funds necessary to proceed with a four-ship conversion program. In December 2002, the Under Secretary of Defense for Acquisition, Technology, and Logistics granted production approval for the *Ohio*-class SSGN Program. Three years later, *Ohio* re-entered the Fleet as the first *Ohio*-class SSGN.

One of the primary reasons for this rapid acquisition process is the changing face of naval warfare. Whereas during the Cold War, the United States Navy operated predominantly under, on, and above the world's deep oceans, smaller regional conflicts such as the Global War on Terror have replaced the set-piece confrontations of previous decades. These smaller, lower-intensity conflicts are likely to occur in the littorals, where most of the today's navies operate. To deploy in this new environment, the Navy is undertaking a number of acquisition programs to meet this emergent need. The SSGN program is one of these.

Ohio, Michigan, Florida, and *Georgia*'s missions as SSGNs will be in stark contrast to strategic deterrence. Instead of carrying twenty-four nuclear-tipped ballistic missiles, each SSGN will carry up to 154 TOMAHAWK land-attack cruise missies and up to 66 Special Operations troops. The TOMAHAWKS will be loaded into seven-round Multiple All-Up-Round Canisters (MACs), installed in missile

SSGN Program History

1994: Nuclear Posture Review concluded that the United States needed only fourteen of the planned eighteen *Ohio*–class (SSBN-726) submarines for Strategic Deterrence

1999: Congress approved funding for a concept study and requested an analysis for the SSGN conversion

2000: Congress authorizes funding for a design study

2001: Congress provides additional funds needed to proceed with a four-ship program.

January 2002: USD (AT&L) approves the SSGN acquisition strategy and four-ship schedule. Preliminary design and Engineered Refueling Overhaul planning authorized

June 2002: DAB Program review approved detail design and Long Lead Time Material (LLTM) procurements and initiated FY03 Engineered Refueling Overhaul

September 2002: Conversion detail design and LLTM contracts awarded

November 2002: USS *Ohio* (SSGN-726) begins Engineered Refueling Overhaul

December 2002: SSGN Program receives Milestone C approval

January 2003: USS *Florida* (SSGN-728) fires two TOMAHAWK missiles during a Demonstration Validation and then conducts the GIANT SHADOW Sea Trial, SSGN's first concept and capabilities test

August 2003: USS *Florida* (SSGN-728) begins Engineered Refueling Overhaul. Scheduled to return to the Fleet in April 2006

March 2004: USS *Michigan* (SSGN-727) begins Engineered Refueling Overhaul. Scheduled to return to the Fleet in December 2006

October 2004: SILENT HAMMER demonstration conducted

March 2005: USS *Georgia* (SSGN-729) begins Engineered Refueling Overhaul. Scheduled to return to the Fleet in September 2007

December 2005: USS *Ohio* (SSGN-726) returns to the Fleet

U.S. Navy photo

tubes 3 through 24. Additionally, tubes 3 through 8 are designed to accommodate stowage canisters that can hold provisions, SOF equipment, and other items needed to keep the SSGNs forward deployed.

Tubes 1 and 2 are being converted into swimmer lock-in/lock-out trunks. The ships will also be able to mount an Advanced SEAL Delivery System (ASDS) or a Dry Deck Shelter (DDS) to further enhance the SSGN's ability to carry out and support Special Operations. Each SSGN will be able to carry two ASDS, two DDS, or one of each. Also, a number of external stowage spaces are built into the SSGN's superstructure, facilitating the boat's ability to carry out prolonged campaigns.

Unlike SSBNs, which rarely communicate with the outside world, SSGNs must work in concert with U.S., allied, and joint forces. To facilitate this interaction, the SSGNs will have the Common Submarine Radio Room (CSRR), which represents a leap ahead and will be common to all classes. It will provide the joint connectivity needed to best utilize the SSGN's capabilities across all mission sets.

The four SSGNs are also receiving two High Data Rate Antennas that will enable them to send and receive an unprecedented amount of electronic information. Four Universal Modular Masts (UMMs) will also be incorporated into the sail. The UMM payloads, unlike those on traditional masts, can be swapped out and offloaded in a matter of hours, instead of days, to meet mission needs.

Being able to "plug and play" has been at the forefront of the Submarine Force's modernization efforts. The use of Commercial Off-The-Shelf (COTS) computing systems, combined with open architecture configurations, has been a modernization priority since the first Acoustic Rapid COTS Improvement (A-RCI) Advanced Processor Build (APB) in 1998. The lessons learned in A-RCI program, the first program to successfully deploy a COTS-based open architecture system, have been applied to AN/BYG-1 Combat Control System, the AN/BLQ-10 Electronic Surveillance (ES) System, the CSRR, the Integrated Submarine Imaging System (ISIS), and the Submarine Tactical and Local Area Network systems. The combination of COTS and open architecture allows for the rapid integration of upgrades and new technologies without conducting expensive and time-consuming rip-outs of obsolescent components. Instead, annual software and bi-annual hardware upgrades are used to rapidly add additional capabilities and insert new technology in submarines. The SSGNs, like the rest of the Submarine Fleet, will integrate these COTS open architecture systems into its Submarine Warfare Federated Tactical System allowing the ships to benefit from regular software and hardware improvements for the next two-plus decades.

The Battle Management Center (BMC) will also benefit from COTS and open architecture. The BMC provides a joint command and control facility onboard the SSGNs. Two Sea Trials, GIANT SHADOW in January 2003 and SILENT HAMMER in October 2004 proved that a deployed Joint Task Force commander can control a variety of assets – submerged, surface, and airborne – while deployed onboard an SSGN. The SSGN Program is examining concepts that will

provide the ability to deploy joint command/control systems in a reconfigurable BMC, allowing rapid integration of new technologies with reduced alteration costs. *Michigan* and *Georgia* will likely be the first platforms to implement these concepts.

The SSGNs' deployment cycle will differ significantly from those of the remaining SSBNs. *Ohio, Florida, Michigan*, and *Georgia* will spend 70 percent of their remaining operational life forward-deployed. The submarines will deploy for 73 days at a time, return to a port for a 21-day maintenance upkeep, switch crews – the SSGNs retain both their Blue and Gold crews – and then deploy for another 73 days. After four such cycles, the ships will have a more comprehensive 100-day, maintenance period that will be used for technology refreshes or work that cannot be conducted during the shorter maintenance times. Once all four SSGNs return to the Fleet, there will be on average 2.4 SSGNs forward deployed at all times.

The SSGNs will not only be potent warfighting assets, they will also help to advance undersea technologies and payloads. Thanks to their twenty-two large diameter ocean interfaces and unprecedented payload capability, the SSGNs will act as the test and evaluation platform for new weapons and off-board sensors. In fact, during both the GIANT SHADOW and SILENT HAMMER Sea Trials, the stand-in SSGNs launched, communicated with, and controlled the Seahorse Unmanned Undersea Vehicle (UUV) operated by the Naval Oceanographic Office. Thus, the Navy has already proved the feasibility of deploying and operating a UUV from a submerged submarine. The Navy is also pursuing the Buoyant Universal Broaching Launcher (BUBL), which will be able to accommodate payloads that are not designed for submarine use. When released from the missile tube, the watertight BUBL floats to the surface, where it launches the payload – missile, UAV, or sensor – into the air without it getting wet. This capability could greatly enhance the SSGNs' ability to undertake an even wider range of missions.

With their unprecedented payload capacity, SSGNs will be able to deploy with a mix of Special Forces, TOMAHAWKs, and new technologies. One or more missile tubes can be designated to test new payloads without dramatically impacting warfighting capabilities. Consequently, new and innovative technologies can be tested and evaluated during operations, which will shorten their design and testing, and hasten their Fleet introduction.

The payloads tested and proven onboard the SSGNs will benefit the entire undersea force. With the move toward common sonar, combat, weapons control, and communications systems, the capabilities we demonstrate onboard the SSGNs will be readily adaptable to the rest of the Submarine Force. The *Virginia*-class (SSN-774) will be a primary beneficiary of the SSGNs' ability to conduct test and evaluation of new payloads, because *Virginia*'s modular design and open architecture is tailor-made for the rapid integration of new payloads and sensors. The SSGN, then, will not only make an immediate impact on the Navy's ability to forward-deploy a large number of Special Forces and strike weapons, but it will likely shape the capabilities of the future Submarine Force to a significant degree.

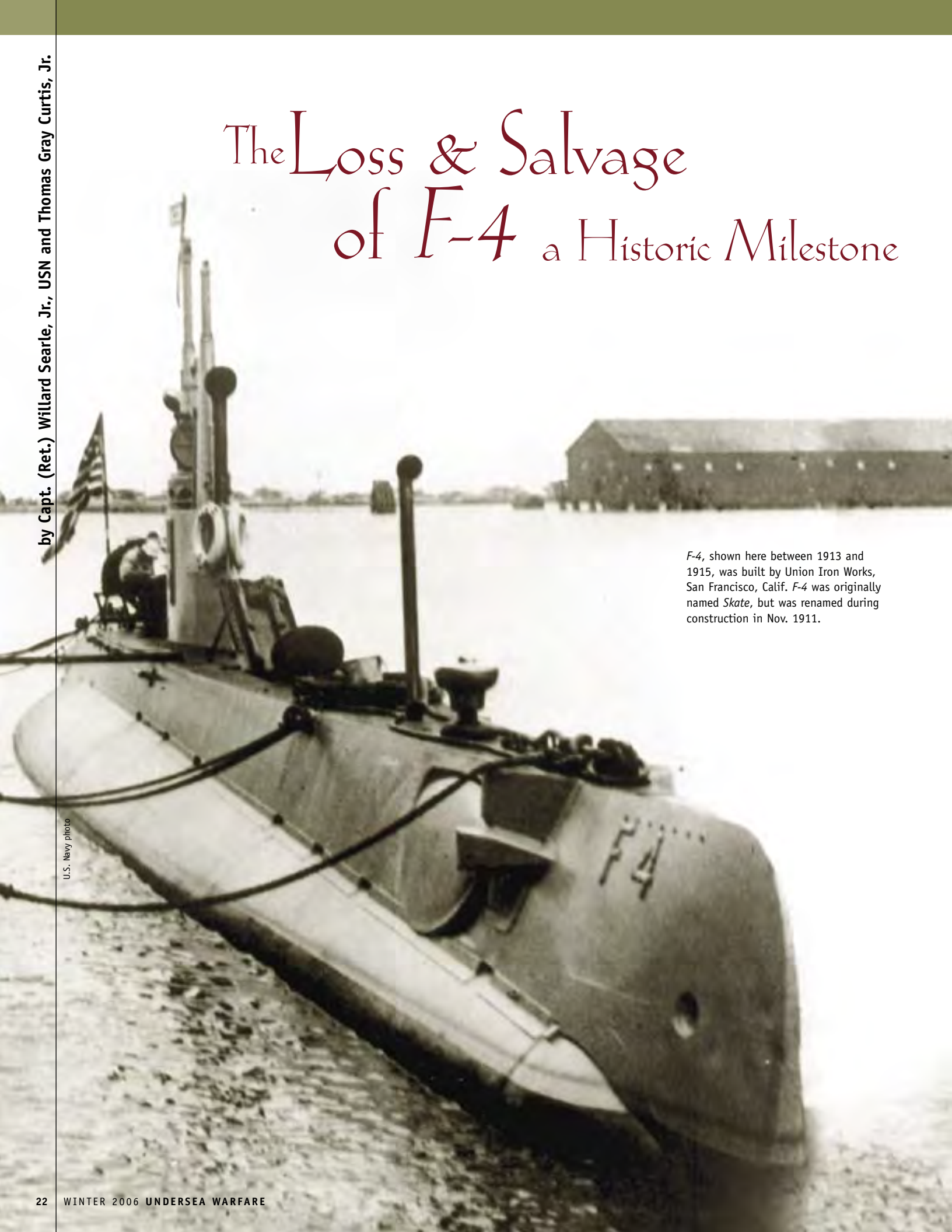
At the May 2001 United States Naval Academy graduation ceremony, President George H. W. Bush referred to SSGN as a transformational program. But SSGN is not transformational because of its mission – submarines have been conducting SOF missions since World War II and have been able to fire TOMAHAWK cruise missiles since the 1980s. The SSGN program is transformational because in six short years, the Submarine Force is taking four excess Cold War submarines and transforming them into powerful, flexible, and stealthy platforms that are designed to meet today's and tomorrow's needs. What is also transformational is the SSGN's ability to act as a forward-deployed command and control platform and to carry out a variety of strike missions without requiring a separate logistical tail. Another transformational aspect of the program is its aggressive acquisition strategy. The Navy is wasting no time in getting these powerful assets back to the Fleet and into the operator's hands. Lastly, the SSGNs will be an important test platform for future payloads and technologies. With *Ohio*'s delivery to the Fleet in December 2005, the SSGN program is the first transformational platform to enter service, and in doing so, it has reaffirmed the Navy's and the Submarine Force's ability to adapt to meet emerging needs.

Capt. Norris is SSGN program manager (PMS 398) at the Naval Sea Systems Command (NAVSEA) in Washington, D.C.

Ohio can be seen here during her conversion process at Puget Sound Naval Shipyard and Intermediate Maintenance Facility.

The Loss & Salvage of *F-4* a Historic Milestone

by Capt. (Ret.) Willard Searle, Jr., USN and Thomas Gray Curtis, Jr.



F-4, shown here between 1913 and 1915, was built by Union Iron Works, San Francisco, Calif. *F-4* was originally named *Skate*, but was renamed during construction in Nov. 1911.

U.S. Navy photo

Background

After the Spanish-American War in 1898, Spain ceded the Philippines and Guam to the United States, and American Samoa and Hawaii were soon added as additional Pacific territories. Because San Pedro, the principal U.S. naval base on the West Coast, was so remote from the Central and Western Pacific, the decision was made in 1904 to build another naval base at Pearl Harbor to better protect U.S. territories farther west.

The Torpedo Boat Flotilla of the First Submarine Division of the Pacific Fleet, consisting of four *F*-class submarines under the command of Lt. Charles E. Smith, USN, were the first U.S. Navy vessels "home ported" at Pearl Harbor, with the mission of providing coastal defense for the Hawaiian islands. Since they were too large to be transported to Honolulu as deck cargo and had neither the range nor habitability for the voyage from California, the four boats, *F-1* through *F-4*, were towed to Pearl Harbor by the cruisers USS *South Dakota* (CA-9) and USS West *Virginia* (CA-5) in the summer of 1914. Because Pearl Harbor was still under construction at that time, the submarines moored to the tender USS *Alert* (AS-4) at the Naval Station in Honolulu Harbor. When not ashore, the submarines' companies lived onboard the tender.

During the fall and winter of 1914, the boats of the division put out for short cruises to practice diving and become familiar with the local waters. Periodically, engineering runs were conducted to test readiness, crew proficiency, and the endurance of the boats, which was measured on the surface at a constant standard speed, with decks awash and only the temporary cruising bridges above water.

With the coming of World War I, the German East Asiatic Cruiser Squadron, nominally based at Tsingtao, China, posed a serious threat to Allied shipping and island installations, but with its destruction by the Royal Navy at the Battle of the Falkland Islands in December 1914, no credible German threat remained in the Pacific. Thus, life on the Honolulu-based submarines was far from arduous, and the greatest danger to their crews came from the boats themselves. Then as now, mistakes led to unforgiving consequences. Like all submarines of their day, the *F*-class boats required high levels of intensive maintenance. They were the first U.S. submarines to be powered by diesel engines, vibration was a major source of mechanical problems, and electrical grounds – "short circuits" – were virtually persistent. As Admiral William Crowe, Jr. wrote about these early submarines, "The technical problems were formidable: unsafe structures, unreliable engines, inefficient storage batteries, poor communications, inadequate optics, primitive metallurgy, poor construction techniques, and on and on."[1] Voluntary service was encouraged by providing hazardous duty pay in the form of "diving dollars." In 1915, enlisted men earned a "diving dollar" for each dive for up to 15 dives a month and 60 dollars went to their next of kin if they didn't return. Thus, both to maintain proficiency and keep their crews happy, commanding officers scheduled frequent diving practice.

F-4's Last Dive

On Thursday, March 25, 1915, *F-1*, *F-3,* and *F-4* went out to sea for routine diving exercises. Just beyond the Quarantine Wharf, while moving out into Honolulu's outer harbor and Mamala Bay, Lt. j.g. Alfred Ede, in command of *F-4*, attempted a dynamic dive, i.e., submerging while making forward headway. He was proud of his crew's ability to coordinate the new procedures that transferred the submarine from a diesel-powered surface ship to a submerged, battery-powered, and lethal warship in just a few minutes.

That morning, the submarine flotilla's tender, Alert, left the floating drydock of the Inter Island Steamship Company, delaying *F-4*'s departure. A month earlier, *F-4* was in the same dock getting new high-pitch propellers, which reduced vibration problems by permitting top speed at lower engine RPM. On this morning, as *F-4* proceeded out of the harbor and passed the outer buoy at a periscope depth, she encountered *F-1* coming in to port. It was 0925. As Lt. Ede observed Ens. Harry Bogusch on *F-1* through the periscope, Bogusch doffed his cover as he watched a well-trimmed *F-4* going out to sea. A mile west of the outer buoy Lt. F.W. Scanland, commanding *F-3*, waited for *F-4* to clear the area before coming in to port. However, he never caught sight of *F-4* departing the harbor, so *F-3* returned to port by 0945.

What subsequently happened on *F-4* is somewhat conjectural, but it is based on physical evidence reviewed by the board of inquiry after the boat was salvaged. Just as she was passing the outer buoy, with Lt. j.g. Ede taking the boat gradually to a depth of 60 feet, traces of chlorine gas stung the noses of the crew in the middle – or control – compartment, and *F-4* overshot her target depth. Apparently, a significant quantity of seawater had reached the battery spaces.

The presence of chlorine gas caused Ede to order procedures immediately to bring the boat to the surface and into shallow water. The diving planes were set to rise, and the helmsman was ordered to make a 10-degree turn to starboard to take the boat into the shoal waters southwest of Sand Island. The starboard motor was stopped and the port motor run at top speed until apparently it overheated and burned out an armature coil,[2] shutting the motor down. Both motors had a tendency to run hot, and the fact that the new propellers drew more current for the same thrust as their older counterparts, added to the problem. With enough headway, the diving planes could have counteracted the negative buoyancy caused by the flooded battery wells, but when propulsion and forward headway was lost, the extra weight of water was sufficient to drag the boat down.

In the middle compartment, several crewmembers were apparently overcome by chlorine gas and the rest retreated to the engine room after manually tripping the automatic blow, which would direct air from the high-pressure air bank to the after, middle, and forward main ballast tanks. As the crewmembers vacated the middle compartment, they secured the bulkhead door behind them.

Because of a delay in expelling ballast, increasing depth caused water to flood into the boat faster than blowing could expel it, and the submarine bottomed at a depth of 300 feet. There, the water pressure caused a line of rivets on the torpedo hatch doubler plate to fail, permitting the forward two compartments to flood rapidly. Consequently, the engine room bulkhead could not withstand the hydrostatic pressure and collapsed, flooding the engine room and drowning all within.

Initial Rescue Attempts

Around 1030, with *F-4* not in port, Ens. F.J. Lowry, the Officer-Of-the-Deck on *Alert*, sounded the alarm. At 1050, a speedboat, commanded by Ens. Harry Bogusch of *F-1*, was dispatched to

U.S. Navy photo

F-4, shown here in the foreground, with her sister ships *F-1*, *F-2*, and *F-3*.

search for the missing submarine. At 1145, *F-3* went out to signal to *F-4*, using a submarine bell,[3] cruising submerged back and forth outside the harbor entrance and sounding the bell about every minute while listening for a response from *F-4*. No responses came. *Alert* and other powerboats joined the search in short order. At noon, *Alert* sent a wireless to Rear Adm. Charles B. T. Moore, Commandant of the Pearl Harbor Naval Station, reporting that *F-4* was overdue.

The first indications that *F-4* sank were air bubbles and an oil slick found by the searching boats in the early afternoon. Rescue efforts swung into high gear. Lt. Smith, as on-scene commander, anchored *Alert* in the outer harbor, and Lt. Cmdr. Julius A. Furer of the Construction Corps was given the responsibility for the technical management of the ensuing rescue and salvage effort. This exceptional engineer had specified and procured the shipyard machinery for the Pearl Harbor facilities while at the Philadelphia Naval Shipyard and had subsequently been ordered to Hawaii in 1913 to oversee the installation. Fortuitously, he was on hand to contribute his expertise to finding and raising *F-4*.

A flotilla of vessels, both naval and civilian, dragged the waters of the outer harbor hoping to snag the submarine so that it might be pulled into shallow water where any survivors might be rescued. By discovering paint and brass on some of the cables, the *F-4* was eventually located at a depth of approximately 50 fathoms on a bearing of 024 degrees true to the Honolulu Harbor light, at a range of 2,800 yards. When dragging failed to move the bottomed submarine, a dredge with 50 tons of reserve buoyancy attempted vainly to hoist the boat and drag it inshore. On Sunday, the 28th, after 72 hours of relentless and unsuccessful efforts in moving the submarine, the rescue attempt was discontinued. At that point, salvage became the main objective.

Raising the *F-4*

By 1915, 16 boats had been lost since the advent of the modern submarine, accounting for the death of about 200 men. Great Britain had lost 78 men in six boats and France 77 in four, but until the loss of the *F-4*, the United States had been untouched. The Navy and the nation were unprepared for this first loss of a U.S. submarine, and no similar salvage project had been previously attempted. Lt. Cmdr. Furer's greatest challenge was to raise the boat with minimal additional damage so that the cause of her loss could be determined.

In a first attempt, Furer converted two mud scows to windlass-equipped pontoons to hoist the wreck to the surface using two cables looped around the hull. With a pontoon on each end of the submarine, the four windlasses should have been able to lift the *F-4*'s 260-ton submerged weight. Another two cables from the dredge *Gaylord* would enable the waterlogged *F-4* to be lifted and towed into shallow water by the Navy tug USS *Navajo* (AT-64).

Initially, the depth of water made it impossible for the divers of the Submarine Division to reach the wreck and sweep the lifting cables under it. However, Gunner George D. Stillson, who initiated the Navy's stage decompression research in 1912, had recently devised techniques for allowing deep-sea divers to work safely in water depths greater than sixty feet. By having divers rest at several stages on their way back to the surface, would protect them from "bends." Furer requested that Stillson's deep-sea divers be sent from the New York Navy Yard. The diving party and their gear were rushed by forced-draft train from New York to San Francisco, where they boarded the waiting cruiser USS *Maryland* (CA-8) for Honolulu.

The first diver to reach *F-4* on April 14 reported only a light gloom and no difficulty in seeing 50 feet or more. He located the submarine in a clean sandy area "like a nice smooth beach,"[4] but sloping downward at about 9 degrees.[5] Importantly, he saw no damage to the hull, and thereafter, the diving team was a key factor in raising the boat. Even so, there were slips and delays. On April 17, for example, one of the deep-sea divers tangled his lines at a depth of 250 feet and had to be retrieved and put into surface decompression for 20 hours – earning his rescuer, Chief Petty Officer, F.W. Crilly, the Medal of Honor.

For over a month, the salvors struggled to lift and tow *F-4* into shallow water. Setting the lifting cables under the bow and stern of the wreck became routine, as frequent breakage of the cables required repeating the operation. But the work progressed well, and by the morning of May 25, *F-4* had been lifted and towed into water 50 feet deep.[6] That afternoon, however, an approaching storm raised combers that tossed the scows back and forth through distances of about 40 feet and threatened to drive everyone aground. After two of the lifting cables parted, the remaining two

were also let go, so the two scows and dredge could be towed to safe haven in the inner harbor. The ensuing storm persisted for days.

Subsequently, it was discovered that the heavy swells had torn a large hole in the port bow of the submarine between frames sixty-one and sixty-five. Since heavy seas are common during June and July on the south coast of Oahu, there was a real danger that supporting *F-4* with fore and aft pontoons could break her in half while she was being towed through the channel, blocking the passage for other vessels.[7] Because strengthening *F-4* to withstand larger dynamic loads would be too costly and time consuming, an alternative was needed.

Lt. Cmdr. Furer then proposed using multiple submersible pontoons to raise *F-4*. These would act as attachable ballast tanks, which could be flooded down and submerged to secure them to the hull and then dewatered with air to raise the submarine. The new salvage plan would use three pontoons on each side of the wreck to cradle it on six transverse chains when the pontoons were raised. Thus, the weight of the hull would be more evenly distributed and well supported on both sides of the section weakened by the hole in the bow.

During June and July, Mare Island Naval Shipyard built two large and four small cylindrical pontoons designed by Furer. Both sizes were steel cylinders 32 feet long, with the smaller pontoons providing 63 tons of lift and the larger 84, for a total of 420 tons – sufficient to lift the wreck, with some margin for overcoming adhesive forces between *F-4* and the bottom. A watertight bulkhead divided each pontoon into two compartments that could be flooded or blown independently for adjusting trim, and to prevent the pontoons from spinning around their longitudinal axes, two tons of concrete were placed in them while horizontal.

U.S. Navy photo

(above) F-4 in drydock in Honolulu, Hawaii after she had been raised from 300 feet of water. Note the large implosion hole in her portside.

(below) The salvage pontoons can be seen on the surface, off Honolulu, after the final lifting of the sunken submarine in preparation for towing her into harbor.

U.S. Navy photo

On Aug. 12, *Maryland* arrived at Honolulu with the pontoons and other gear needed for the final attempt, which required that the support chains be passed beneath the submarine, and the pontoons attached and dewatered. Divers, working at a depth of 46 feet[8], excavated tunnels under the wreck, so that the cradling chains could be rove between the pontoons. This work was completed on Aug. 25, and the next day the large pontoons were positioned by the *Reclamation*, a wrecking barge in a four-point moor over *F-4*. Five-inch Manila "tending" lines were attached to the ends of the pontoons to control the lowering of each one to the seafloor as they were ballasted with water. Once the pontoons were on the bottom and flooded down, the chains that cradled the submarine were rove through the hawse pipes on the pontoons and secured with clamps by divers. Over the next two days, the smaller pontoons were lowered and secured. On Aug. 28, with all the pontoons in position, *Reclamation* was replaced by a coal barge carrying a bank of submarine air flasks to supply air for divers and dewatering the pontoons.

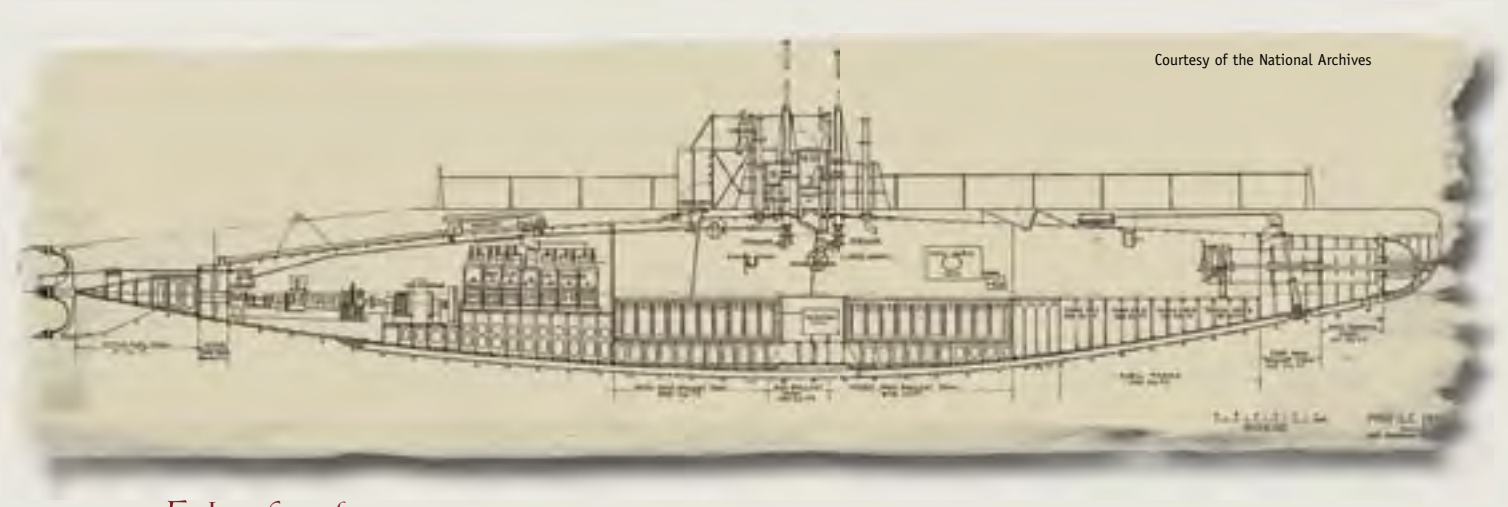
Early the next day, a beautiful Sunday morning, Navy divers connected the hoses from the air manifold on the barge, to the vents on top of the pontoons. Dewatering commenced at 0640. The two bow pontoons came to the surface at 1216 in a swirl of rising air bubbles, and within a half hour, the amidships and aft pontoons also appeared. After all pontoons had surfaced, the pontoons came to an even keel and the load was distributed on the supporting chains, the air vents and flood valves were closed and the air hoses disconnected.[9] At that point, the bottom of the submarine was six feet below the surface, and the nearly upside-down *F-4* drew a maximum of 20 feet. Lines were cast off at 1345, and *F-4* and her supports were towed into the harbor. The stately procession proceeded to the Quarantine Wharf while nearby ships flew colors at half-mast. The next day the entourage moved into the floating drydock of the Inter Island Steamship Company, and at about 2345 on 30 August, *F-4* came into view, lying on her side in the dock, a stream of fuel oil pouring from a gash in the hull.

In the early morning hours of Aug. 31, powerful lights were shone into the hull and revealed that the boat was filled with large quantities of muck, dead fish, and debris, which prevented further inspection until later in the morning. Subsequently, Navy crews removed the bulk of the debris through the gash in the port side and searched the boat's compartments for the bodies of the crew. Some time later, the unidentified remains of seventeen men on eternal patrol were interred in a communal grave at Arlington National Cemetery.

Causes of the Disaster

Shortly after *Maryland* arrived in Honolulu in April, a Board of Inquiry convened to determine the causes of the accident. Although officers and men of the flotilla could lend some insight to general conditions in the division, without the wreck, the causes of failure could only be speculated. A second Board of Inquiry met for the first time as the drydock was being dewatered on Aug. 30. The Board held 16 meetings to analyze the cause of *F-4*'s loss – taking great care to differentiate the damage caused by recovery efforts, from that sustained in the sinking.

After the investigation of the wreckage in the dry dock, the board concluded that corrosion around the rivets in the forward battery tank was a major cause of the disaster. The 60 cells that comprised the forward battery were grouped in 12 slop tanks within a lead-lined well fitted with a drain so that any sulfuric acid which spilled into it could be pumped out. Unknown to the crew, some of the marine glue used by the builder to seal the tank



Courtesy of the National Archives

F-class Specifications

Length: 142′ 7"

Beam: 15′ 5″

Draft: 11′ 8″

Displacement (submerged): 342 tons

Surface speed: 14 knots

Submerged speed: 11 knots

Test Depth: 200 ft.

Armament: 4 x 18″ torpedo tubes

Many of the personnel who participated in the salvage effort are pictured here with *F-4* and the giant pontoons that were used to raise her.

U.S. Navy photo

seams had dislodged and plugged the drain, causing the acid accumulated in the well to dissolve the zinc impurities in the lead lining. This permitted the leaking acid to corrode nearby steel. The high stress areas around the rivets were particularly susceptible to corrosion. Seawater seeped around corroded rivets common to the middle main ballast tank and the forward battery tank.

The authors believe that the bypassing of an unreliable component – the magnetic reducer – in the ballast system and a closed Kingston valve in the forward ballast tank contributed to the delay in blowing the boat's ballast. Also, as has been observed in subsequent problems in air lines, blockage due to constricted flow between the high-pressure air supply and the 100-pound manifold may have had a significant influence on the failure of *F-4* to resurface.

The *F*-class boats of the Torpedo Boat Flotilla remained in Honolulu until relieved by a flotilla of newer *K*-class boats in November 1915. Towed back to Mare Island, the *F*-class boats were decommissioned and thoroughly inspected for deterioration similar to that found in *F-4*, before being refurbished and returned to service. In subsequent designs, the battery wells were separated from other tanks by a cofferdam.

F-4 remained in Hawaii. In mid-September 1915, after completing the investigation into her loss, the Navy let her rest. Rather than being scuttled at sea, the ex-*F-4* was towed to a backwater of Pearl Harbor and beached at half tide in 19 feet of water,[10] in hope that natural deterioration would ease the eventual task of blasting and removing the hull. However, the Navy needed her temporary resting place for a 1940 expansion of the Pearl Harbor facilities, and that year her remains were rolled as fill into a large trench excavated next to the hulk. Under ground, she "now lies on a heading of 043.5 degrees true, 40 feet from the submarine berth Sierra 14." [11]

Capt. Searle, a 1946 graduate of the U.S. Naval Academy, served as an Engineering Duty Officer until his retirement in 1970. From 1964 until 1969, Capt. Searle served as the Supervisor of Salvage under the then-Naval Ship Systems Command.

Mr. Curtis worked as a civilian with the Department of the Navy as an engineer in the Office of the Supervisor of Salvage beginning in 1968 and then as a planner and diver in the Field Project Office of the Naval Facilities Engineering Command.

Endnotes

1 Crowe, William J., Jr., United States Submarines, Barnes & Noble Books, New York, 2002, pp. 40-41

2 Board of Investigation aboard the USS *Maryland* April 15, 1915, into the causes that kept the F-4 from surfacing after being submerged on March 15, 1915. Citations of testimony is delineated by the witness's name and the number of the question to which the witness is responding. Mallien, 11

3 A submarine bell, mounted on the after deck, provided a means of signaling while underwater. Operated pneumatically, it was struck, for example, to signal when entering and leaving port. It was replaced by the Fessenden electroacoustic "oscillator" which was capable of sounding signals in Morse code.

4 Honolulu Star Bulletin, April 14, 1915, "*F-4* is Found By Crilly in a Record Dive."

5 Furer, J.A. memorandum 5001 of April 27, 1915, p. 47.

6 Furer, J. A., memo to: Bureau of Construction and Repair, of: Feb. 24, 1916, Subject: Salvage operations on Submarine *F-4*, p.55.

7 Furer, J. A., "Salvage Operations on Submarine *F-4*," U.S. Naval Institute Proceedings, Annapolis, MD, v41, 1915, pp 1833-1871.

8 Furer. J. A., memo to: Bureau of Construction and Repair, of: Feb. 24, 1916, Subject: Salvage operations on Submarine *F-4*, p.55.

9 USS *Maryland* Deck Log of Aug. 29, 1915.

10 Bucon memo C&R No.2-S23-2 Serial No. 41703 of Oct.4, 1915 to: SECNAV, Subj: Report of beaching of submarine *F-4* at Pearl Harbor.

11 John F. Riley, "USS *F-4* Found Final Resting Place at Pearl," U.S. Naval Institute Proceedings, Annapolis, MD, October 1963. p.22.

Submarine Learning Facility Norfolk Opens New Tactical Trainer

by Chief Petty Officer (SW/AW) Mark Piggott

Submarine Learning Facility (SLF) Norfolk recently opened the Submarine Force's newest tactical trainer for use by the Fleet. The Submarine Multi-Mission Team Trainer, Phase 3 (SMMTT 3) provides shore-based training for submarine combat control and sonar systems.

SMMTT 3 incorporates the latest simulation technology to enable submarine crews to rehearse tactical missions in environmental and tactical conditions that realistically simulate those found anywhere in the world.

"The goal of SMMTT 3 is to provide a place where ships can come to get the latest and greatest, up-to-date training," said Cmdr. Michael Jones, SLF Commanding Officer.

SMMTT 3 supports the Navy's Revolution in Training and Sea Warrior program by delivering the right training at the right time to the right Sailors for the right cost. It allows the Norfolk Submarine Learning Facility to provide the most realistic submarine training possible to local submarines.

"It's just amazing to see this come together after five years of hard work," said Capt. Arnold Lotring, Commanding Officer, Submarine Learning Center. "There is no other trainer like this in the world. The modeling and the fidelity are unmatched. Our submariners deserve it."

"This is a quantum leap in being able to make the system realistic," Cmdr. Jones added. "The technology that backs this system up is head and shoulders above anything we've ever seen before."

Another aspect of the SMMTT 3 is its external communication capabilities. Submarines and surface ships will be able to "link up" for exercises, allowing battle group training for Fleet Synthetic Training (FST) exercises, without leaving the pier.

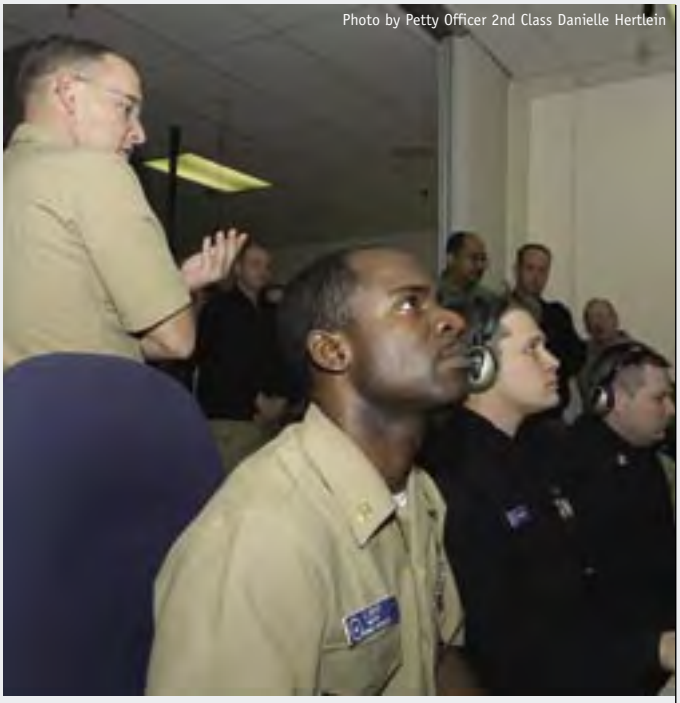


Photo by Petty Officer 2nd Class Danielle Hertlein

The Submarine Learning Facility's Submarine Multi-Mission Team Trainer, Phase 3 will provide shore-based training for submarine combat control and sonar systems.

"We can't wait for the first FST to be run over there," Capt. Lotring said. "We are ready to do some interactive training."

SMMTT 3 development began in 2002, under the sponsorship of OPNAV N771B and the Program Management of NAVSEA 07L1. A preliminary version of the system was delivered to the Submarine Learning Facility at the same time new combat control and sonar systems were being delivered to two Norfolk based submarines. This accomplished a major goal set by OPNAV N77 with regards to ensuring that shore based Team Trainers would be available to support delivery of state of the art COTS tactical changes to deploying submarines.

"SMMTT 3 is setting the bar for training," said Chief Petty Officer (SS/SW) David Newsome, SMMTT 3 Instructor. "This is the first trainer that has been built at the same time as new systems were installed on submarines on the waterfront. So now, when they pull into port and want to stay proficient, they can march right up into the trainer and stay proficient."

One of the key training tools built into SMMTT 3 is the multi-mission capability of the trainer. According to Newsome, SMMTT 3 is capable of "one stop shopping" for submarine crews looking for training. SMMTT 3 can simulate any scenario required for today's submariner, from littoral navigation to intelligence, surveillance, and reconnaissance (ISR) missions.

"Undersea warfare, anti-submarine warfare, ISR, these are all things are that we, as submariners, do for a living. It's our bread and butter," Chief Petty Officer Newsome said. "It's important to have a facility where they can come in and we can place them in a 'real-time' scenario and practice the things they would do at sea."

The SMMTT 3 trainer is the combined effort of three Navy Labs – Naval Surface Warfare Center (NSWC), Carderock Division; Naval Undersea Warfare Center (NUWC), Newport Division; and NAVAIR Training Systems Division. Over the next two years, NSWC Carderock Division will deliver seven additional systems to submarine training sites in Pearl Harbor, Hawaii; Bangor, Washington; New London, Connecticut; Kings Bay, Georgia; and San Diego, California.

"It's absolutely imperative that we have this capability for the ships ready to deploy, as well as training under the fleet response training plan," said Capt. Jamie Foggo, Commodore, Submarine Squadron SIX. "As you look at the future of the 688 Navy, we're modernizing; we're bringing a lot of ships up to the 21st Century."

"They'll have the benefit of SMMTT 3," he continued, "which will match the configuration on the ships, which will make their at-sea time more fruitful because the crew will have already seen all these problems run import."

"It's a force multiplier for me as squadron commander," Capt. Foggo concluded.

You can find more information about the Submarine Learning Center on the web at https://www.npdc.navy.mil/slc/.

Changes Of Command

COMSUBGRU-10
Rear Adm. Frank Drennan relieved
Rear Adm. Mark Kenny

COMSUBRON-3
Capt. Joe Tofalo relieved
Capt. L. David Marquet

COMSUBRON-8
Capt. Earl Carter relieved
Capt. Bob Hennegan

COMSUBRON-20
Capt. Joseph Rogers relieved
Capt. Steven Struble

Commanding Officer, NSSC
Cmdr. Michael Pietkiewicz relieved
Cmdr. Mark Waller

USS Dolphin (AGSS-555)
Cmdr. Andrew Wilde relieved
Cmdr. Edward Hasell

USS Philadelphia (SSN-690)
Cmdr. Jeff Jablon relieved
Capt. Robert Brennan

USS Albuquerque (SSN-706)
Cmdr. Robert Douglass relieved
Cmdr. Stuart Munsch

USS Augusta (SSN-710)
Cmdr. Jim Childs relieved
Cmdr. Mike Haumer

USS Norfolk (SSN-714)
Cmdr. Scott Adams relieved
Cmdr. David Herman

USS Henry M. Jackson (SSBN-730)
Cmdr. Kevin Jones relieved
Cmdr. Paul McHale

USS Alabama (SSBN-731)(B)
Cmdr. Melvin Lee relieved
Cmdr. Kevin Fontes

USS Pennsylvania (SSBN-735)(G)
Cmdr. Steven Benke relieved
Cmdr. David Knapp

USS Maryland (SSBN-738)(G)
Cmdr. Mark Van Ye relieved
Cmdr. Scott Rauch

USS Rhode Island (SSBN-740)(G)
Cmdr. Steve Gillispie relieved
Cmdr. Pete Clarke

USS Alexandria (SSN-757)
Cmdr. Mike Bernacchi relieved
Cmdr. Thomas Kearney

USS Boise (SSN-764)
Cmdr. Rod Mills relieved
Cmdr. Doug Mikatarian

USS Charlotte (SSN-766)
Cmdr. Bobby Pannell relieved
Cmdr. Dennis Carpenter

Qualified For Command

Lt. Cmdr. Noel Gonzalez
COMSUBRON-2

Lt. Cmdr. Chad Hennings
COMSUBRON-2

Lt. Cmdr. Gary Jacobsen
COMSUBRON-20

Lt. Cmdr. Jeffrey Lamphear
USS Topeka (SSN-754)

Lt. Cmdr. Sean Szymanski
COMSUBRON-4

Lt. Wesley Bringham
SUBDEVRON-12

Lt. Anthony Grayson
COMSUBRON-4

Lt. Christopher Hover
SUBDEVRON-12

Line Officer Qualified In Submarines

Lt. Patrick Burke
USS Hyman G. Rickover (SSN-709)

Lt. Bennett Christman
USS Springfield (SSN-761)

Lt. Kevin Smith
USS Florida (SSGN-728)

Lt. William Wolf
USS Boise (SSN-764)

Lt. j.g. John Ahlstrom
USS Seawolf (SSN-21)

Lt. j.g. Mark Allen
USS Maryland (SSBN-738)(G)

Lt. j.g. James Asaro
USS Louisiana (SSBN-743)(G)

Lt. j.g. John Babick
USS Pittsburgh (SSN-720)

Lt. j.g. Richard Baldwin
USS Jacksonville (SSN-699)

Lt. j.g. David Band
USS Tennessee (SSBN-734)(B)

Lt. j.g. Darrin Barber
PCU Texas (SSN-775)

Lt. j.g. William Barry
USS Maine (SSBN-741)(B)

Lt. j.g. Thomas Bullock
USS Memphis (SSN-691)

Lt. j.g. Tyler Cameron
USS Connecticut (SSN-22)

Lt. j.g. Travis Chapman
USS Rhode Island (SSBN-740)(G)

Lt. j.g. Anthony Chiappetta
USS Maine (SSBN-741)(B)

Lt. j.g. Bryan Christiansen
USS Alaska (SSBN-732)(B)

Lt. j.g. Edward Cimbalik
USS Tennesse (SSBN-734)(G)

Lt. j.g. David Daigle
USS Hyman G. Rickover (SSN-709)

Lt. j.g. Nicholas Darling
USS Florida (SSGN-728)

Lt. j.g. Steven Dawley
USS Memphis (SSN-691)

Lt. j.g. Cedric Dedeaux
USS Wyoming (SSBN-742)(G)

Lt. j.g. Scott Delwiche
USS Wyoming (SSBN-742)(G)

Lt. j.g. Lance Denham
USS Minneapolis-St. Paul (SSN-708)

Lt. j.g. Christian Diaz
USS Wyoming (SSBN-742)(B)

Lt. j.g. Grant Elliott
USS Hartford (SSN-768)

Lt. j.g. Christian Esquivel
USS Jacksonville (SSN-699)

Lt. j.g. Jeffrey Finlay
USS Louisiana (SSBN-743)(G)

Lt. j.g. Stephen Feddor
USS Wyoming (SSBN-742)(G)

Lt. j.g. William Fitzgerald
USS Portsmouth (SSN-707)

Lt. j.g. Matthew Fuhrmann
USS Pittsburgh (SSN-720)

Lt. j.g. Jeffrey Gammon
USS Maryland (SSBN-738)(B)

Lt. j.g. John Genta
USS Chicago (SSN-721)

Lt. j.g. Jacob Hurt
USS Toledo (SSN-769)

Lt. j.g. Carlos Jorge
USS Portsmouth (SSN-707)

Lt. j.g. Benjamin Kim
USS Pennsylvania (SSBN-735)(B)

Lt. j.g. Colin King
USS Maryland (SSBN-738)(G)

Lt. j.g. Blake Klinedist
USS Alexandria (SSN-757)

Lt. j.g. Matthew Koch
USS Georgia (SSGN-729)

Lt. j.g. William Lahnen
USS Maryland (SSBN-738)(B)

Lt. j.g. David Latta
USS Wyoming (SSBN-742)(B)

Lt. j.g. Richard Linnell
USS Connecticut (SSN-22)

Lt. j.g. Patrick Luquire
USS Nebraska (SSBN-739)(G)

Lt. j.g. Carlos Martinez
USS Chicago (SSN-721)

Lt. j.g. Nevin McChesney
USS Louisiana (SSBN-743)(B)

Lt. j.g. Brian McGillick
USS Toledo (SSN-769)

Lt. j.g. Richard McMunn
USS Tennessee (SSBN-734)(B)

Lt. j.g. Dennis Milsom, Jr.
USS Miami (SSN-755)

Lt. j.g. Christopher Moore
USS Rhode Island (SSBN-740)(G)

Lt. j.g. Brian Murphy
USS Boise (SSN-764)

Lt. j.g. Brendan Naeve
USS Seawolf (SSN-21)

Lt. j.g. Samuel Nakamine
USS Pennsylvania (SSBN-735)(B)

Lt. j.g. Gary Olson
USS Seawolf (SSN-21)

Lt. j.g. John Olson
USS Connecticut (SSN-22)

Lt. j.g. Jeffrey Petrosky
USS Annapolis (SSN-760)

Lt. j.g. Andrew Privette
USS Ohio (SSGN-726)

Lt. j.g. Bryan Reed
USS Chicago (SSN-721)

Lt. j.g. Matthew Reiland
USS Montpelier (SSN-765)

Lt. j.g. Aaron Riggio
USS Ohio (SSGN-726)

Lt. j.g. Matthew Rohr
USS Albuquerque (SSN-706)

Lt. j.g. Christopher Seaward
USS Connecticut (SSN-22)

Lt. j.g. Jason Singleton
USS Rhode Island (SSBN-740)(G)

Lt. j.g. Jacob Sistrunk
USS Rhode Island (SSBN-740)(G)

Lt. j.g. Jared Smith
USS Maryland (SSBN-738)(G)

Lt. j.g. Bobby Stancil
USS Maryland (SSBN-738)(B)

Lt. j.g. Sean Stein
USS Providence (SSN-719)

Lt. j.g. Nicholas Sternowski
USS Rhode Island (SSBN-740)(G)

Lt. j.g. Scott Stewart
USS Santa Fe (SSN-763)

Lt. j.g. Garth Storz
USS Memphis (SSN-691)

Lt. j.g. Douglas Szwarc
PCU Texas (SSN-775)

Lt. j.g. Marlon Terrell
USS Rhode Island (SSBN-740)(G)

Lt. j.g. David Thomas
USS Boise (SSN-764)

Lt. j.g. Gregory Thompson
USS Los Angeles (SSN-688)

Lt. j.g. Michael Vasek
USS Maine (SSBN-741)(G)

Lt. j.g. Aaron Wagner
USS Hartford (SSN-768)

Lt. j.g. Ashley Wright
USS Montpelier (SSN-765)

Lt. j.g. Robert Zuppert
USS Seawolf (SSN-21)

LIMITED DUTY OFFICER QUALIFIED IN SUBMARINES

Lt. Jeffrey Miller
USS Boise (SSN-764)

Lt. Darrin Pitre
USS Florida (SSGN-728)

Ens. Robert Horton
USS Olympia (SSN-717)

Qualified Nuclear Engineer Officer

Lt. Michael Slavik
USS Ohio (SSGN-726)

Lt. j.g. Jeffrey Ammon
USS Alabama (SSBN-731)(B)

Lt. j.g. Michael Cagulada
USS Topeka (SSN-754)

Lt. j.g. Andrew Crawford
USS La Jolla (SSN-701)

Lt. j.g. Keith Davidson
USS Columbus (SSN-762)

Lt. j.g. Brandon Deshaw
USS Columbia (SSN-771)

Lt. j.g. Tomasz Dmitrukowski
USS Alabama (SSBN-731)(G)

Lt. j.g. Adam Driessen
USS ASHEVILLE (SSN-758)

Lt. j.g. William Dull
USS Charlotte (SSN-766)

Lt. j.g. Tim Farward
USS Louisville (SSN-724)

Lt. j.g. Matthew Feist
USS Los Angeles (SSN-688)

Lt. j.g. Matthew Frye
USS Cheyenne (SSN-773)

Lt. j.g. Theodore Goda
USS Salt Lake City (SSN-716)

Lt. j.g. Zachary Hollcraft
USS Columbus (SSN-762)

Lt. j.g. William Lewis
USS Helena (SSN-725)

Lt. j.g. Benjamin Long
USS Cheyenne (SSN-773)

Lt. j.g. Joshua Mock
USS Houston (SSN-713)

Lt. j.g. Matthew Pesce
USS Salt Lake City (SSN-716)

Lt. j.g. Brian Sisco
USS Pennsylvania (SSBN-735)(G)

Lt. j.g. John Stevenson
USS Los Angeles (SSN-688)

Lt. j.g. Matthew Sullivan
USS Tucson (SSN-770)

Lt. j.g. Mike Svatek
USS La Jolla (SSN-701)

Lt. j.g. John Thorpe
USS Pennsylvania (SSBN-735)(G)

Lt. j.g. Meng Tia
USS Pasadena (SSN-752)

Lt. j.g. Matthew Willett
USS La Jolla (SSN-701)

Lt. j.g. Philip Yi
USS Alabama (SSBN-731)(G)

Supply Corps Officer Qualified In Submarines

Lt. Damon Allen
USS Key West (SSN-722)

Lt. David Frazer
USS City of Corpus Christi (SSN-705)

Lt. Jimmy Karam
USS Ohio (SSGN-726)

Ens. Brendon Kearney
USS Hyman G. Rickover (SSN-709)

Lt. Frank Maurer
USS Maryland (SSBN-738)(G)

Lt. j.g. Bryan Hammes
USS Chicago (SSN-721)

Lt. j.g. Jarett Wolfe
USS Olympia (SSN-717)

Ens. Robert Evans
USS Philadelphia (SSN-690)

Ens. Jason Harper
USS Maine (SSBN-741)(B)

Ens. Michael Kidd
USS Scranton (SSN-756)

Ens. Jarred Posada
USS Rhode Island (SSBN-740)(G)

Ens. Shawn Smith
USS Tucson (SSN-770)

Qualified Surface Warfare Officer

Lt. Hugh Evan
USS Emory S. Land (AS-39)

Lt. James Scalzo
USS Emory S. Land (AS-39)

Lt. Robert Hutchins
USS Emory S. Land (AS-39)

Lt. j.g. Michael Cleveland
USS Emory S. Land (AS-39)

Ens. Timothy Threadg
USS Emory S. Land (AS-39)

Chief Warrant Officer James Harris
USS Emory S. Land (AS-39)

Change Of Homeport

USS Louisiana (SSBN-743) arrived at her new homeport in Bangor, Washington on Oct. 12, 2005.

Special Recognition

Congratulations to Petty Officer 2nd Class Matthew Ugarph (USS Olympia (SSN-717)) and Petty Officer 1st Class (SS) Richard Dobias (Naval Submarine Training Center Pacific) who were selected to 2006 Seaman to Admiral 21(STA-21) Program.

Sea Predator: A Vision for Tomorrow's Autonomous Undersea Weapons

continued from page 15

self-propelled warhead, should the LD MRUVV effort run into difficulties.[1] And though not optimized for deep water, DADS and/or ADS are developmentally mature and offer an interim Sea Predator FORCEnet targeting capability.

In any event, judicious technology integration and development for Sea Predator will provide a new 21st-century weapons system that will be fully-autonomous, long-enduring, remotely-controlled, and highly feared. It will address multiple sub-surface or surface targets rapidly and will be an undeniable force multiplier. Particularly important is this last attribute – "force multiplier." Sea Predator will significantly augment assets such as LCS and allow these valuable manned platforms more opportunity to pursue other wartime missions. And let's not forget that in all of this, the Mine Community will become a valued member of the Submarine Community, and vice versa. A win-win situation if there ever was one!

A "Way Ahead" for 21st-Century Mines

Steeped in frightening lethality, and drawing upon a highly-impressive record in 20th-century naval operations, the sea mine – or rather a transformation of the sea mine into the "Sea Predator" – offers similar warfighting potential against the new enemies projected for the 21st-century. While the standard sea-control and defensive barrier roles of mines continue to be important today, a key new role for future mines is *protecting the Sea Base*. Indeed, the Sea Predator – a 21st-century "weapon that waits"- could be the Mine Warfare Community's "ticket" to continuing relevance in U.S. naval warfare for decades to come.

Dr. Widmayer is a senior naval warfare advisor with Anteon Corporation. Dr. Truver is the group vice president for Anteon Corporation's Center for Security Strategies & Operations in Washington, D.C.

1 Editor's Note: CNO OPNAV N77 does not have a program of record for modifying the SDV.

COMNAVSUBFOR Meets with Norfolk Waterfront Submariners

by Chief Petty Officer Dave Fliesen (SW/AW), USN

Vice Adm. Chuck Munns, Commander, Naval Submarine Forces, spoke with approximately 200 submarine officers during a waterfront forum at Naval Station Norfolk Dec. 15.

Vice Adm. Munns briefed the group on the status of the Force and encouraged them to foster the special talents and contributions of the submarine community, and spread the message to others less familiar with the Silent Service.

Commander Naval Submarine Forces, Vice Adm. Chuck Munns, talks with over 200 submarine officers during a "waterfront call" at Devary Hall on Naval Station Norfolk, Va.

Photo by Chief Petty Officer Dave Fliesen

"We go to places where others can't go," said Munns, "capturing knowledge and delivering products that affect the nation. While ASW [anti-submarine warfare] is important, it's not our primary role. We leverage our stealth to prepare the battle space so we don't have to fight the fight, but if the need arises, we have the knowledge to fight from a position of strength and the capabilities to soundly defeat our adversaries."

Munns said more than half of the Submarine Force was engaged in 2005 with global deployments, independently or with a Carrier or Expeditionary Strike Group. Those deployments included work with partners from 27 countries operating a total of 224 submarines, such as Operations Active Endeavor, Exercise Sorbet Royal, Pacific Reach, Priz submarine rescue, and the Diesel Electric Submarine Initiative.

"Regardless of where we're stationed," Vice Adm. Munns said, "we go to where the need is."

Commanding officers (COs) are a critical key to successful deployments and missions, Vice Adm. Munns said, adding that there's no greater responsibility in the world than to be the commanding officer of a submarine.

"The Admiral expects COs to make the best decision based on risk management," said Lt. Adam Thomas, assistant engineer on USS *Montpelier* (SSN-765), an audience member. "He reinforced to us the importance of measuring all available information and weighing the consequences to make the best decision."

For Lt. Thomas and others, the opportunity to hear from and to address questions to the Force Commander was appreciated.

"He gave a good vision for our future and our current focus," he said. "We certainly understood that the *Virginia*-class is the way-ahead for the Navy."

View From the Top

U.S. Navy photo

The fast attack submarine USS *Charlotte* (SSN-766) broke through thick ice to surface at the North Pole during their Arctic transit from Pearl Harbor, Hawaii, to Norfolk, Virginia. Even though the wind chill factor reached a low of -50 degrees, crewmembers ventured out on the ice for a once-in-a-lifetime opportunity for some "ice liberty."

AIM-9X Land Launch Demo Advances Sub Payload Capability

by Team Submarine Public Affairs

The Navy successfully conducted a research and development (R&D) land based test at an Army range in New Mexico, leveraging the Sidewinder AIM-9X missile, an air-to-air missile used on tactical fighter aircraft, during proof of concept testing for critical missile adaptation features for submarine use.

Among the test objectives achieved in November 2005 were the ability to vertically launch the missile from zero velocity, and to lock-on after launch. The test was a collaborative effort between the Joint Program Office for Air to Air Missiles, Raytheon Missile Systems, and Team Submarine Advanced Research. Capt. Mark Bock, program manager for Team Submarine's Undersea Defensive Systems Program Office, led this effort.

The land launched test involved detecting, tracking and destroying an unmanned helicopter drone. The target was not visible to the missile at launch. The missile turned and acquired the target several miles down range, remaining locked on until intercept.

Many "firsts" were achieved during this demonstration. Aside from the zero air speed vertical launch, this test was also the first AIM-9X launched from an Army Chaparral trailer, the first AIM-9X to engage a target below 3,000 feet, or 300 knots, and the first launch using a commercial off the shelf fire control system.

Because the AIM-9X missile is a good choice for research and development (R&D) of small missile payloads for the guided missile submarines (SSGNs) and attack submarines (SSNs), the results can be extended to other missile payloads and different platforms such as the Littoral Combat Ship.

The next step in this R&D process is to analyze the vertical launch thrust characteristics of gas production and temperature in support of encapsulation for an underwater test.

According to Capt. Bock, planning for in-water testing of the capability is underway.

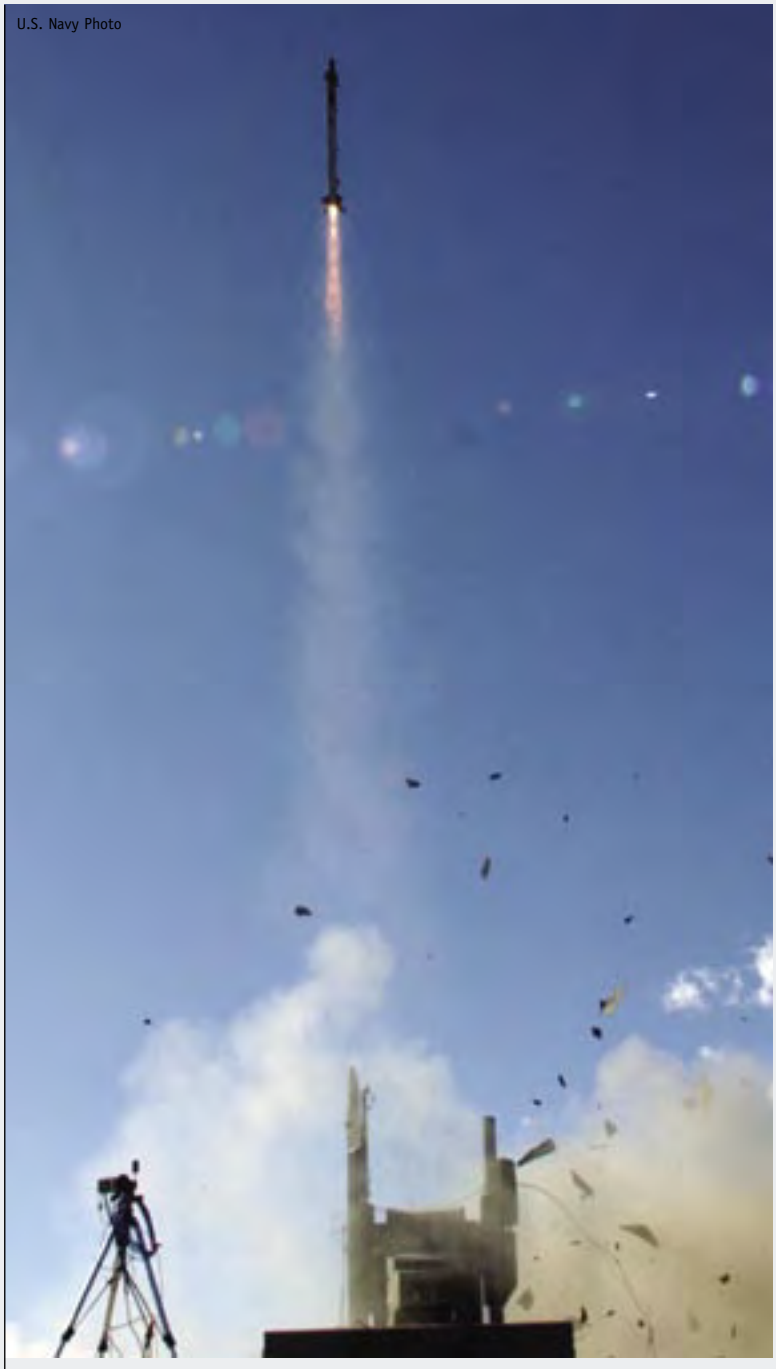
"The 'encapsulation' technique will be the forerunner for deploying air breathing payloads like unmanned aerial vehicles from submarines in the future," he said.

The most mature of these encapsulation technologies, the Stealthy Affordable Capsule System or SACS, will be leveraged for the next phase of risk reduction testing. This effort will demonstrate the capability to encapsulate and perform submerged launch of the AIM-9X from a launch fixture representative of a submarine Vertical Launch System (VLS) that is currently used for TOMAHAWK cruise missiles.

The long-range research goal is to be able to field any existing Department of Defense missile payload onboard submarines rapidly and at low cost.

> "The 'encapsulation' technique will be the **forerunner** for deploying air breathing payloads like unmanned aerial vehicles from submarines in the **future**."
>
> Capt. Mark Bock

U.S. Navy Photo



(above) An AIM-9X missile is successfully tested at an Army testing range in New Mexico. The missile test was conducted to determine the feasibility of firing the AIM-9X from submarines.

Is it on your 'scope yet?

UNDERSEA WARFARE Magazine is looking for this year's top submarine related photos for the 8th Annual Photo Contest, sponsored by the Naval Submarine League. The best of the best will be published in the Summer 2006 issue.

Note: Entries must be received by April 14, 2006. However, time permitting, photos received after the deadline will be considered. Photos must be at least 4" by 6" at 300 dots-per-inch (dpi) and previously unpublished in printed media. Each person is limited to five submissions, which can be sent as JPGs or other digital photo formats to the e-mail address below. Printed photos can also be mailed to the address below:

Military Editor
Undersea Warfare CNO
2000 Navy Pentagon, Washington, DC 20350-2000
or email UnderseaWarfare@navy.mil

For more information, visit
http://www.chinfo.navy.mil/navpalib/cno/n87/usw/issue_23/photo.htm

Cash prizes for the top four pictures!

$500 1st Place $250 2nd Place $200 3rd Place $50 Honorable Mention

On The Back

"The Kill" by Georges Schreiber. The final act in a drama at sea. The skipper of a sub and one of his lookouts watch eagerly through their glasses as the victim of their torpedoes up-ends and plunges toward the bottom – one less ship for the enemy to throw against the Allies. The flame of the fire lights a pathway for the sub as she races toward the sinking ship in the hope of picking up prisoners.
Georges Schreiber, born in Brussels in 1904, began painting and drawing at an early age and went on to study art formally in Berlin, London, Rome, Paris, and Florence. He came to the New York in 1928 and stayed for nine months and settled there permanently in 1933. In 1943 Schreiber produced several submarine themed works for the Abbot Collection of Submarine Paintings, collaborating with Thomas Hart Benton.

"The Kill"

by Georges Schreiber